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June 1964

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1004-2

19-22 FEBRUARY 1964

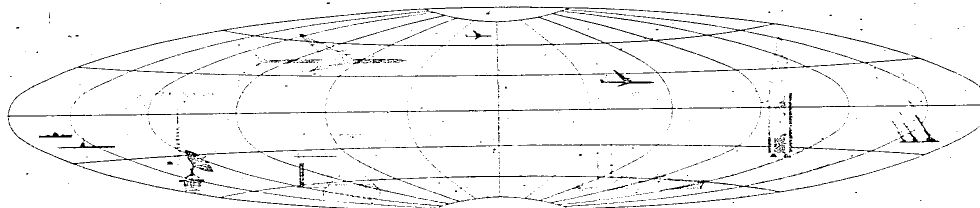
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SYNOPSIS

Mission 1004-2 (system J-5) was the second payload recovered from vehicle No 1174. The first photography exposed on this mission was on pass D49 after ejection of the "A Bucket" (Mission 1004-1). Mission 1004-2 accomplished 64 revolutions of which 32 were operational (photography was accomplished). The payload consisted of 3,858 panoramic frames (2,909 FWD, 2,949 AFT). Seventy-five feet of stellar index film and 135' of film exposed in the terrain index camera was recovered. The characteristics of the photographic take in regard to the panoramic cameras is very similar to that of Mission 1004-1, which is considered to be a good mission.

The panoramic cameras used on this mission operated well with the exception of soft-spots on the master take and a few other minor degradations.

Due to the large difference in densities recorded within a pass, portions of 19 passes of the master and 25 passes of the slave panoramic camera positives were reprinted at a special density for the PI's.

The weather was exceptionally good during this mission, with only 32.5% cloud cover. Another factor that lends to the favorable overall average of the mission is that exposures were generally made while the solar elevation was favorable.

The stellar index camera operated poorly throughout the mission. When functioning correctly, stars to the fifth magnitude could be discerned.

The terrain index camera functioned well.

The horizon cameras generally operated well but the port horizon appeared to be consistently underexposed.

GENERAL FLIGHT DATA

Date of Launch: 15 February 1964

Orbital Parameters:

Planned	Actual (Revolution 92)
Period: 90.07 min	90.78 min
Perigee: 100.0 nm	102.35 nm
Perigee Latitude: (Not Available)	43.25° north
Apogee: 236.0 nm	245.51 nm
Eccentricity: 0.019	0.0198
Inclination Angle: 75°	75.06°

PART I. CAMERA OPERATION

1. Master (FWD) Panoramic Camera No 124: This is the same camera used in Mission 1004-1. Therefore, as would be expected, the characteristics of the photographic take are very similar. The photography is highly degraded, due to image softness, in an area approximately 1.0" wide along the camera number edge in the first 3 to 15 frames of nearly every pass. This soft

imagery extends from 3.0" to 8.0" from the take-up end of the affected frames. There are three small emulsion digs just inside the format adjacent to the camera number on every frame. A minor emulsion abrasion extends edge to edge in line with each dig.

Minor corona static discharges and occasional minor associated equipment shadow-

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graphs appear intermittently near the center of the format.

A group of short, fine emulsion scratches parallel to the major axis of the film begins approximately 1.5" from the take-up end of each frame and extends approximately 3.0" toward the supply end. Thin, random, longitudinal emulsion scratches are frequent throughout the mission. Rail scratches are severe from head to tail.

A diagonal streak of fog extends into the format from the untitled edge on the third frame of most passes. The existence and density of the fog is dependent on the duration of the camera-off period.

The camera speed had a tendency to be slow on the first frame of some passes near the end of the mission, resulting in image smear as well as gross overexposure.

2. Slave (AFT) Panoramic Camera No 125: This camera was operational throughout the mission and, like the master camera, is the same unit used in Mission 1004-1.

Frames 29 thru 38, pass D49 of Mission 1004-1, which were recovered in this payload capsule, were severely damaged at the processing site.

Random longitudinal emulsion scratches are intermittent throughout the mission. Rail scratches are continuous from head to tail.

There is corona fog at the take-up end of the third or fourth frame of nearly every pass. The resulting degradation is minor.

A light leak resulting in a diagonal streak of fog emitted from the titled edge affects the fifth frame of nearly every pass. The existence and density of this fog is associated with the duration of the camera-off period.

Beginning at pass D86 there are from 1 to 3 random minus density spots approximately 0.1" in diameter on nearly all subsequent frames. Some of these spots are apparently the result of

a roller-induced film crimp. The reason for others has not been determined.

3. Master (FWD) Horizon Cameras:

a. The port (supply) horizon camera operated normally through pass A71E. Horizon images, fiducials, binary words and end-of-pass markers do not appear on passes D72, frame 54; D85, frame 75; D87, frame 136; D103, frames 57 and 133. Underexposure prevails at the beginning of most passes but improves on passes which occur over areas of high solar elevations. All horizon images are slightly vignetted in two corners. Where the exposure is sufficient to permit analysis, acuity is very good.

b. The starboard (take-up) horizon camera operated normally through pass A71E. Horizon images, fiducials, the binary words and end-of-pass markers do not appear on pass D72, frame 54; D85, frame 75; D87, frame 136; D103, frames 57 and 133. When operational, the exposure was adequate and the acuity is very good. As in the port cameras all horizon images are slightly vignetted. There is a small plus density area at the edge of the format opposite the horizon image which is believed to be a reflection.

4. Slave (AFT) Horizon Camera:

a. The starboard (supply) horizon camera functioned normally throughout the mission. Some imagery is slightly vignetted on every format. The exposure was adequate and the acuity is very good.

b. The port (take-up) horizon camera functioned normally throughout the mission. The first few frames of most passes were underexposed but as the solar elevation improved the exposure became adequate.

The two west-looking (starboard) horizon cameras were set at f/8.0, 1/100 second with Wratten 25 filters and the east-looking (port) cameras were set at f/6.8, 1/100 second and equipped with Wratten 25 filters. The east horizon, photographed with the port camera, was

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often underexposed due to the unfavorable solar elevations. Horizon imagery in all four cameras is slightly vignetted but the vignetting does not hinder the useability of the horizon arcs for vehicle attitude determination. The design of the horizon cameras now employed is such that slight imagery vignetting will always be present.

5. Stellar Index Camera No D42/42/37: The camera operated erratically throughout the mission. There were eight double exposures during the course of the mission and 57 frames were grossly overexposed and unusable due to the shutter hanging open. The shutter also remained open while the film was being advanced on 53 occasions. Due to the shutter not opening or not opening long enough to form an image, 25 frames are clear in the first 350 programmed. There were no stellar images after frame 350. The program called for 407 frames. The correlation fiducial lamps did not function during the mission. Edge static is continuous on both edges throughout. A diagonal plus density band, attributed to a light leak, is apparent on nearly every frame. The moon is imaged on frames 298-355.

6. Terrain Index Camera No D42/42/37: The camera operated normally throughout the mission with the exception of a double exposure on frame 5. The imagery recorded is of good quality except for 8 frames affected by a minor light leak.

7. Collateral Equipment:

a. The 200 cycles per second (cps) frequency marks are present on all frames throughout the mission. On the Master (FWD) cameras, the marks are imaged in the format and, being superimposed on the terrain imagery, are not

readable except on engineering passes and passes where the imagery is of low density. The frequency marks are printed outside of the terrain format on the slave panoramic camera but are reflected into the format edge. However, they are readable throughout and the reflection does not seriously degrade the pan camera imagery.

b. Light number 11 of the binary data block on the slave camera did not function during the mission. Light number 14 failed on frame 92 of pass D85 and on all subsequent frames. The binary data block of the slave camera tracks into the panoramic format on most frames. The binary data block of the master camera was operational and readable throughout except on pass D72, frame 54; D85, frame 75; D87, frame 136; D103, frames 57 and 103. The images of the data block on both cameras is slightly bloomed.

c. The terrain and stellar index camera correlation fiducial marks failed to operate during the entire mission.

d. The camera-off marker of the slave camera recorded satisfactorily through pass D56. On passes A56E, A71E and A72E it is superimposed on the binary word. The camera-off marker of the master camera recorded satisfactorily throughout pass D55. The mark is superimposed on the binary word in passes A55E, A56E and A71E. On all passes after A71E, the end-of-pass marker is misplaced and usually appears over the first frame of the following pass.

e. The camera numbers, although bloomed, are recorded and readable throughout.

PART II. FILM

1. Film Processing: This section provides a descriptive evaluation of the exposure and the

processing, and comments on the exposure, the density, the processing and the physical condi-

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tion of the original negative.

Pertinent data was collected during various phases of the processing and more thoroughly during the evaluation of the negatives. This is a standard procedure. The community is informed by cable of any extensive defects in the photography which may affect the P1 suitability of any mission.

Support organizations provided the processing center with pre-launch samples of the actual film used on this mission. These samples, along with fresh process control stock, were sensitometrically exposed and processed at controlled levels of development. A characteristic curve was prepared from these sensitometric strips and is defined as the "Mission Material Processing Curve."

While the film was being prepared for processing, it was inspected for physical damage which could cause processing difficulties. During processing, data was recorded giving the processing conditions and film footage locations where processing changes occur. Changes in the normal course of processing which may affect the film quality were recorded and, after processing, the original negatives were examined frame by frame for defects and damage.

Most of the film on this mission received adequate exposure. The solar elevation varied from a low of -55° on engineering passes A103E and A104E and -5° on operational pass D66 to a high of 68° on pass D103. Acceptable photography was accomplished with a minimum solar elevation of approximately 4°47' in pass D67, at a latitude of 71°30' north. The local time at which the exposure was made was 0942. The photographs taken at the lower latitudes, where the sun was relatively high (30°-40°), tend to be slightly overexposed. The greatest variation of density that is directly attributed to exposure is in the horizon images. On the majority of frames from both FWD and AFT panoramic cameras the

port horizons did not have optimum exposure. The starboard horizons were properly exposed rendering adequate density throughout most of the mission.

The exposure of the stellar index camera appears to be near optimum where not degraded by the various shutter problems. The exposure of the terrain index camera also appears to have been near optimum.

Approximately 50% of the film exposed in the pan cameras received intermediate development, 13% full, and 37% primary. Because of exposure changes due to variations in sun elevation and terrain, approximately 50 changes in the development level were made during the processing of the slave film and approximately 65 changes during the processing of the master film. The gross fog density readings range from a minimum of 0.07 to a maximum of 0.21.

The film from both the stellar and terrain index cameras was processed normally.

The density of the pan camera photography is near optimum considering the latitude of terrain reflectivities encountered on the mission.

2. Film Degradations: This section lists some of the more notable film degradations and a few frames on which examples of each can be found.

a. Master (FWD) Panoramic Camera:

Corona	Small corona discharges are evident in the horizon format of several frames after pass D49. (Examples: pass D50, frames 1, 2, 20.) Minor corona bursts are also common on the third frame after a camera-on position. Examples of this may be found on pass D52, A71E, and D78. On pass D64 and on all subsequent passes corona discharges become more frequent and appear at intervals of approximately 6.3". (Example: D64, frame 35 Fwd.)
Light Leaks	A diagonal band of plus density resulting from a light leak appears on the fourth frame of each pass. The

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	film suspended in the camera during a camera-off position often is slightly fogged, depending on the duration of the camera-off period and the solar elevation during the period. (Example: pass D94, frame 1.)		tain fogging and equipment images due to light leaks within the system. (Example: pass A104E.)
Emulsion Digs	Four small emulsion digs are present adjacent to the camera number just inside the format at each edge.	Manufacturing Splices	Pass D55, frame 33; pass D71, frame 110.
Minus Density Streaks	Faint minus density streaks appear on frames 2-22 of pass D67.	Minus Density Comets	Appear at random throughout the mission. (Example: D71, frame 36.)
Dendritic Static	Small, minor discharges are present occasionally in the third frame following a camera-on position. (Example: A72E, frame 3.)	Emulsion Scratches	Rail scratches are continuous and severe. Longitudinal emulsion scratches appear intermittently throughout the mission, and on pass D49, Mission 1004-1.
Manufacturing Splices	Pass D49, frame 15; pass D68, frame 167; pass D102, frame 87.	Creases and Tears	Severe creasing, tearing, etc., occurred on Pass D49, Mission 1004-1 at the processing site to such an extent that small pieces of film were completely destroyed. A series of crimps and creases appear on pass D103, frames 96-95. Severe film damage occurred on the last 3 frames of pass D112 as the loose end of film was drawn through the camera.
Minus Density Comets	Excessive and pronounced throughout the mission. (Examples: D71, frame 36.)	Blisters	Some of the aforementioned minus density comets were definitely the result of blisters. They are moderate in number but serious in nature.
Emulsion Scratches	Rail scratches are severe and continuous. Several short, longitudinal emulsion scratches appear within a 3.0" band edge to edge beginning approximately 3.0" from the take-up end of each frame. (Example: D62, frame 18.) Pass D111, frames 26-25 were severely scratched as loose film was drawn through the camera.	Pinholes	Minor and intermittent except on pass D71 where they are numerous and associated with the manufacturing splice on frame 110.
Blisters and Pinholes	Minor and Intermittent.		
Image Smearing	This is common on the first 6 frames of most passes on frames exposed before the system overcame inertia. (Example: D62, frames 1-6.)		
b. Slave (AFT) Panoramic Camera:			
Corona Static	There is usually a small discharge on the third frame after a camera-on position. (Example: D64, frame 3.) Pass D66 contains random discharges throughout.	Minus Density Spots	A minus density spot approximately 0.15" in diameter appears intermittently 0.8" from the frequency mark edge on pass D56, frame 7 and on most subsequent frames. Another minus density pattern, in the shape of a half-moon with a tail projected from its concave surface, also begins on pass D56, frame 7 and appears intermittently throughout the remainder of the mission. The spot is approximately 0.1" by 0.1" at the extremes and a small plus density is often noted in the center of the half-moon area. The pattern is suggestive of a crimp.
Light Leaks	There is a plus density band caused by a light leak on the fourth frame after each camera-on position. Several patterns of fog are present on pass D49 (Mission 1004-1). This apparently is associated with the cut and wrap operation. The first and last few frames of most passes con-		

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c. Stellar Index Camera:

Edge Static	Corona and dendritic static discharges along both edges are continuous. There are random static discharges within the format.
Light Leak	A diagonal band of fog appears on nearly every frame and is very distinct on 22 frames.

d. Terrain Index Camera:

Edge Static	Static discharges are continuous along both edges.
Corona	Frame 16 only.
Light Leaks	A band of fog projects into the format from the camera number edge of frames 19, 21, 29, 45, 49, 67, 74 and 81.

PART III. IMAGE QUALITY

1. Photographic Interpretation (PI) Suitability: This is an assessment of the information content of photographic reconnaissance material and its interpretability. A number of interrelated factors are involved, such as the quality of the photography, the extent of target coverage, scale, weather limitations, and similar considerations. However, the fundamental criteria for assigning a PI suitability rating may be reduced to (a) the scope of the photographic coverage and (b) the degree to which a photo interpreter may extract useful and reliable information from the material.

PI suitability ratings are categorized as Excellent, Good, Fair, Poor, and Unusable. These ratings refer to the overall interpretive value of the photography obtained from a particular reconnaissance mission. Individual targets may also be assigned PI suitability ratings if that is necessary or desirable. The standards that determine assignment of the various ratings are as follows:

Excellent: The photography is free of degradation by camera malfunctions or processing faults and weather conditions are favorable throughout. The imagery contains sharp, well-defined edges and corners with no unusual distortions. Contrast is optimal and shadow details, as well as details in the highlight areas, are readily detectable. Observation of small

objects and a high order of mensuration are made possible by the consistently good quality of the photography.

Good: The photography is relatively free of degradation or limiting atmospheric conditions. Edges and corners are well-defined. No unusual distortions are present. Detection and accurate mensuration of small objects are feasible, but to a lesser degree than in material rated as "Excellent".

Fair: Degradation is minimal but the acuity of the photography is less than optimum. Edges and corners are not crisply defined and there is loss of detail in shadow and/or highlight areas. Detection and identification of small objects are possible but accuracy of mensuration is reduced by the fall-off in image quality and the less-than-optimal contrast that prevails.

Poor: Camera-induced degradations and/or weather limitations severely reduce the effectiveness of the photography. Definition of edges and corners is not sharp. Only gross terrain features and culture may be detected or identified and distortion of form may exist. Accurate mensuration of even large objects is doubtful.

Unusable: Degradation of photography completely precludes detection, identification and mensuration of cultural details.

2. PI Suitability for Mission 1004-2: The PI

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suitability for this mission is considered to be good in that fine detail is readily discernible through most of the mission. Photo interpreters reported on 140 targets in the preliminary target read-out of which 9% were given quality ratings of poor and the remainder a rating of good. Snow was the degrading factor on 6% of the targets receiving poor ratings while haze was to blame for the remaining 3%. Highlights of the mission coverage are as follows:

- a. Discovery of construction and activity observed at a missile test center.
- b. Discovery of construction at a nuclear weapons proving ground.
- c. Clear count of aircraft at a military airfield.
- d. Identification of a radar array.
- e. Discovery of a large area of new construction.

Mission 1004-2 produced imagery only slightly inferior to the best ever attained by the KH-4 system. The degradations that are present and the problems encountered that have a direct bearing on PI suitability are as follows:

Corona Static - The degradation of imagery due to the effects of corona discharge is minor on both panoramic cameras.

Light Leaks - Diagonal patterns and equipment shadowgraphs are usually present on one or more of the first five frames and on the last three frames of each pass on both the master and slave panoramic cameras. The fog caused by the light leaks is minor but it does have a degrading effect. A good example of the various fog patterns may be observed on pass D64, frames 4 and 5. These light leaks are a result of the camera design and are not an anomaly.

Scratches and Abrasions - Four small emulsion digs at each edge of the format, adjacent to the camera number, appear on most frames of the master camera. Although these digs are small, had a target fallen in this area,

it would have been degraded or lost.

Atmospherics - 32.6% of the photographic take of this mission is obscured by clouds. Eighty-two known targets were not reported due to atmospherics. Haze degraded 5 targets to such an extent as to be rated poor for photographic interpretation.

Solar Elevation - Most photography was accomplished while the solar elevation was favorable and little imagery was lost.

Image Motion - The first few frames after each camera-on position display this condition. The slow camera speed at the beginning of pass becomes more pronounced as the mission progresses. The PI suitability is highly degraded on the affected frames.

Minus Density Comets - While each comet is very small, the large number of them encountered on this mission makes them a degrading factor.

Minus Density Spots - The small minus density spots on the take of the slave camera suspected to be roller-induced crimps would obscure any imagery within their path.

Soft Spots - The imagery within the area described as being of "soft focus" on the master camera is highly degraded and of little use to the PI.

The image distortions inherent in the KH-4 camera are common throughout the mission. Pass D62, frames 17 FWD and 22 AFT are good examples.

Plus and minus density streaks associated with areas of heavy density (clouds) are noted intermittently throughout the mission.

3. Mission Information Potential (MIP): The MIP is an arbitrary number, not limited by terminal values, which is subjectively assigned to the panoramic photography of a mission and which compares it to the other KH missions. It is meant to be a measure of the camera's maximum capability for recording information, dis-

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counting adverse atmospheric conditions, minimal solar elevations, camera malfunctions or other factors which reduce the quality of the photography. The MIP is based on the best photography found in a mission, even though the photography may be limited to a few frames. Since these frames are considered the best in the mission, they do not indicate the overall success, average quality, or general interpretability of the photography.

Criteria for selection of an MIP frame:

- a. Eliminate all portions of the mission affected by system malfunctions.
- b. Select frames which are free of clouds and atmospheric attenuation.
- c. Eliminate the first ten frames and last frame of a pass as these may be affected by incorrect scan speed.
- d. Select frames that are in a continuous strip of approximately ten cloud-free frames, as cloud shadows from distant weather fronts are cast for great distances.
- e. Determine from the horizon cameras that the panoramic photography is not affected by apparent vehicle perturbations.

f. Select targets that are near the center of format and on frames as close as possible to perigee for scale purposes and to eliminate obliquity.

g. Select frames having near optimum solar elevation, thus eliminating frames having either overexposure or underexposure.

h. Select a high contrast target (preferably an airfield) and compare the target to a previous mission which has been given an MIP rating.

4. MIP For Mission 1004-2: Utilizing the criteria set forth in the preceding items, pass D62, frame 23 AFT was selected as the MIP frame for this mission. The mission was given an MIP rating of 85 and is comparable to Mission 1004-1 (also MIP 85).

The photographic scene covers a city and airfield which are located near the center of the format. Image quality is such that runway markings, aircraft engine nacelles (on larger aircraft), and vehicles in parking lots and on highways are discernible.

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APPENDIX A. SYSTEM SPECIFICATIONS

Panoramic Cameras

	Master (FWD)	Slave (AFT)
Camera No	124	125
Lens Serial No	0642435	1022435
Slit Width	0.250"	0.250"
Aperture	f 3.5	f 3.5
Filter	Wratten 21	Wratten 21
Operational Focal Length	609.60 mm	609.60 mm
Film Type	4404	4404
Film Length	7500'	7500'
Emulsion	45-73-12-3	45-73-12-3
Static Bench Test		
High Contrast	290 L mm	238 L mm
Low Contrast	160 L mm	155 L mm
Dynamic Test		
L. High Contrast	170 L mm	178 L mm
L. Low Contrast	131 L mm	135 L mm
P. High Contrast	183 L mm	215 L mm
P. Low Contrast	107 L mm	108 L mm

Stellar and Terrain Index Cameras

	Stellar	Terrain
Camera No	D42-42-37	D42-42-37
Lens Serial No	10510	813050
Reseau Serial No	37	42
Filter	None	Wratten 21
Aperture	f 1.8	f 4.5
Exposure Time	2 sec	1/500 sec
Operational Focal Length	NA	NA
Film Type	4401	4400
Film Length	75'	135'
Splices	None	None
Emulsion	7-3-1-4	16-4-11-3
Perpendicularity of Reseau	0.00"-0.93"	0.00"-2.25"
Location of Principal Point	NA	NA
Awar	NA	70 L mm

Horizon Cameras

	Starboard (Take-up)	Port (Supply)	Starboard (Supply)	Port (Take-up)
Panoramic Camera No	124	124	125	125
Lens Serial No	812265	812271	812276	812272
Exposure Time	1/100 sec	1/100 sec	1/100 sec	1/100 sec
Aperture	f 8.0	f 6.8	f 8.0	f 6.8
Filter	Wratten 25	Wratten 25	Wratten 25	Wratten 25
Operational Focal Length	54.45 mm	54.33 mm	58.48 mm	58.48 mm
Average Lines/mm	162 L mm	167 L mm	111 L mm	178 L mm
Radial Resolution (L/mm)				
10° off axis	.009 mm	.015 mm	.004 mm	.002 mm
20° off axis	.012 mm	.015 mm	.002 mm	.009 mm
Tangential Distortion	.004 mm	Not Available	.003 mm	.003 mm

Camera No 124

Resolution	Take-up			Supply		
Angle Off Axis	0°	10°	20°	0°	10°	20°
Radial Resolution (L/mm)	157	141	100	157	141	106
Tangential Resolution (L/mm)	168	141	78	177	141	88

Camera No 125

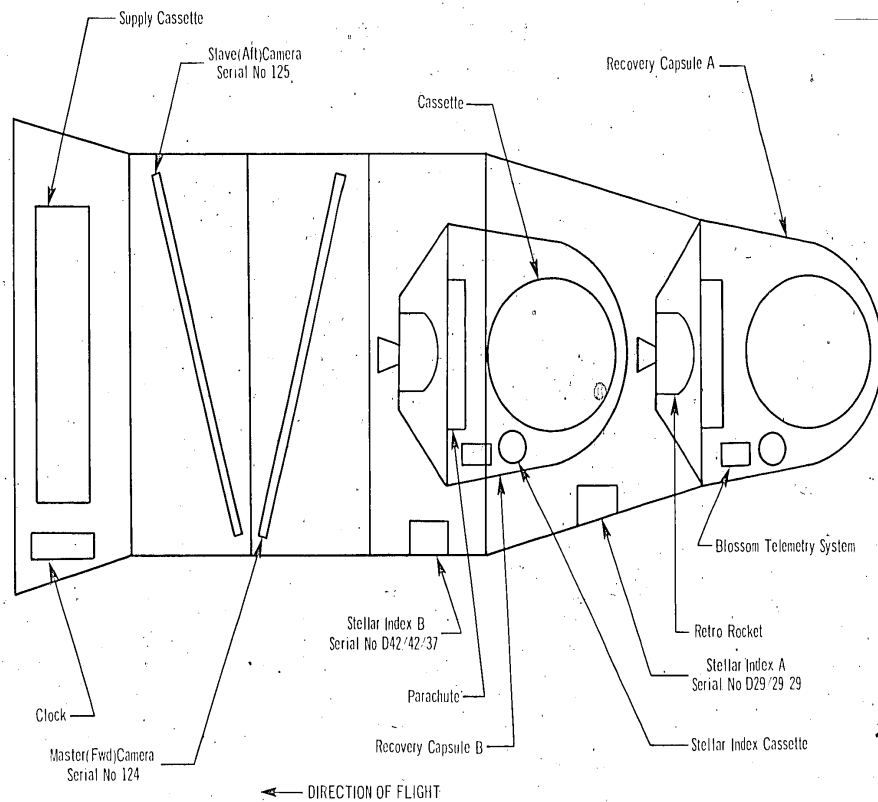
Resolution	Take-up								Supply							
Angle Off Axis	0°	5°	10°	15°	20°	25°	27.5°		0°	5°	10°	15°	20°	25°	27.5°	
Radial Resolution (L/mm)	184	164	144	112	103	105	58		164	164	162	134	109	99	41	
Tangential Resolution (L/mm)	164	145	142	115	86	60	44		164	162	151	121	91	60	41	

Camera No D42-42-37

Resolution	Stellar						Index				
Angle Off Axis	NA	NA	NA	NA	NA	NA	0°	10°	20°	30°	35°
High Contrast	NA	NA	NA	NA	NA	NA	73	92	108	89	77
Low Contrast	NA	NA	NA	NA	NA	NA	73	83	91	35	18

NA denotes Not Available.

VEHICLE LAYOUT

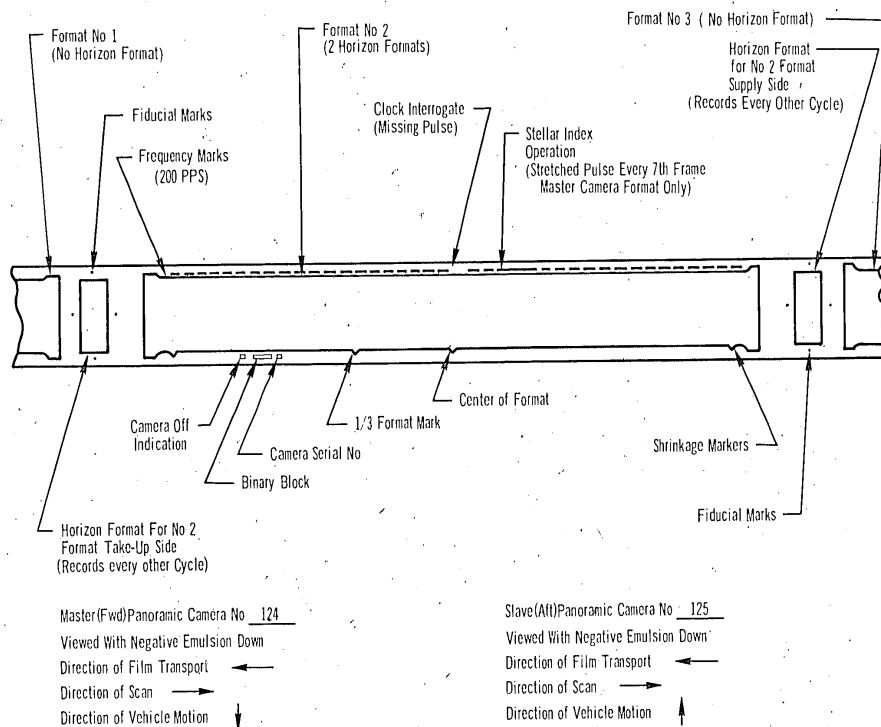


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TOP SECRET RUFF
NO FOREIGN DISSEM

TOP SECRET RUFF
NO FOREIGN DISSEM

FILM SPECIFICATIONS FORMAT LAYOUT



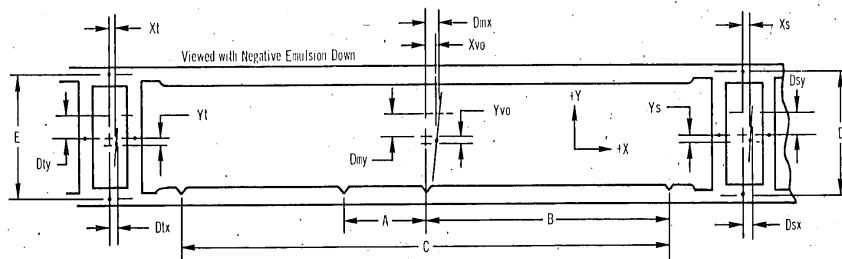
TOP SECRET RUFF
NO FOREIGN DISSEM

TOP SECRET RUFF
NO FOREIGN DISSEM

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REF ID: A660500050005-0

FILM SPECIFICATIONS FORMAT SPECIFICATIONS



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NO FOREIGN DISSEM

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TOP SECRET RUFF
NO FOREIGN DISSEM

Master (Fwd) Camera	Vehicle Motion	Scan Direction	Slave (Aft) Camera	Vehicle Motion	Scan Direction
A 76.1	Xt +0.225	Dtx +0.226	A 76.1	Xt -0.045	Dtx -0.047
B 355.3	Yt -0.089	Dty +2.000	B 355.3	Yt +0.348	Dty -2.000
C 710.3	Xs -0.393	Dsx 0.394	C 710.3	Xs -0.721	Dsx -0.737
D 56.496	Ys +0.036	Dsy 2.000	D 56.488	Ys +0.045	Dsy +2.000
E 56.435	Xvo +0.757	Dmx +0.773	E 56.459	Xvo -0.737	Dmx -0.749
	Yvo +1.104	Dmy 2.000		Yvo +0.306	Dmy -2.000

Format dimensions:

	Panoramic	Take-Up	Supply
Height	55.9		
Width	756.4		

Format dimensions:

	Panoramic	Take-Up	Supply
Height	56.2		
Width	755.3		

- NOTE: 1. All dimensions are in millimeters and are average dimensions of three formats
2. Height of main format is taken at center of format
3. D_t, D_m, D_s, X and Y dimensions are taken 10 MM above point defining target center
4. Format Sign Convention

$$\begin{array}{c|c} -X+Y & +X+Y \\ \hline -X-Y & +X-Y \end{array}$$

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TOP SECRET RUFF
NO FOREIGN DISSEM

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APPENDIX B. TECHNICAL COMPENDIUM

1. Master (FWD) Panoramic Camera

Pass	Frame	Over- lap	Cloud	Univ. Time	Sun Time	Solar Elev.	Pitch	Roll	Yaw (All Minus)*	Alt. (yds)	Terrain			Limiting				Exp
											D Min	D Max	A	D Min	D Max	A	Fog	
D19	01	NR	0021	0050	1007	51.03	NA	NA	NA	NA	NR	NR	NR	0.27	2.25	1.88	0.11	NA
D50	05	06	4212	0116	1027	08.21	11.54	-00.07	01.05	244719	0.74	1.69	0.95	0.74	2.05	1.31	0.21	1.211
D50	11	07	4311	0118	1116	14.56	15.02	00.12	01.04	233726	0.51	1.34	0.83	0.51	1.92	1.41	0.11	1.229
D52	58	06	1111	0121	1220	31.51	15.10	00.25	01.42	211782	0.62	1.21	0.59	0.42	3.05	1.63	0.11	1.256
D52	58	07	1111	0125	1229	33.39	14.08	00.23	01.25	208752	1.25	1.98	0.73	0.85	2.13	1.28	0.11	1.257
D53	06	07	1111	0552	1147	21.23	15.39	00.07	01.00	233759	0.59	1.95	1.06	0.87	2.06	1.19	0.21	1.232
D53	57	09	1111	0556	1232	36.48	15.04	00.26	NA	207148	0.98	1.99	1.01	0.98	1.99	1.01	0.11	1.237
D54	02	00	2234	0719	1027	08.36	14.47	00.23	01.07	247958	0.37	0.44	0.17	0.27	2.07	1.80	0.08	1.194
D54	75	06	4111	0723	1147	21.50	15.28	00.53	01.53	222733	1.07	1.67	0.60	0.60	1.74	1.14	0.08	1.241
D54	87	06	1111	0724	1155	23.44	15.26	00.51	01.39	219022	0.83	1.51	0.68	0.66	1.65	0.99	0.08	1.245
D54	102	NR	1111	0725	1204	25.49	15.15	00.45	NA	217022	1.35	1.59	0.24	0.60	1.71	1.11	0.08	1.247
D55	02	NR	5555	0819	1000	05.38	14.52	-00.17	00.18	255892	NR	NR	NR	0.34	1.63	1.29	0.16	1.156
D55	05	01	3445	0850	1005	06.02	14.58	-00.19	00.18	246516	NR	NR	NR	0.35	1.85	1.52	0.20	1.206
D55	84	NR	5555	0853	1136	18.23	14.28	00.10	01.02	227902	NR	NR	NR	0.78	1.30	0.52	0.07	1.237
D55	124	06	1111	0856	1159	24.27	15.12	00.10	01.14	219148	0.75	1.55	0.80	0.75	1.63	0.88	0.07	1.245
D55	160	08	1111	0856	1215	30.01	15.54	00.15	01.09	214201	1.38	1.80	0.42	0.83	1.80	0.87	0.08	1.253
D55	258	06	1211	0900	1244	42.38	14.34	00.06	00.57	205090	0.57	0.94	0.37	0.41	2.50	1.89	0.08	1.261
D56	56	08	2111	1027	1214	29.52	15.08	00.07	01.11	215492	1.00	1.55	0.55	1.00	1.55	0.55	0.08	1.255
D61	33	NR	4455	1804	1310	NA	15.30	-00.17	00.53	205581	NR	NR	NR	0.80	2.14	1.54	0.09	1.258
D62	01	00	1111	1936	1311	42.54	15.25	00.08	NA	205000	1.59	1.82	0.52	1.20	2.08	0.78	0.09	NA
D62	02	00	1111	1936	1315	43.06	15.25	00.08	NA	205006	0.62	1.38	0.76	0.62	1.68	1.06	0.09	1.181
D62	06	00	1111	1936	1317	43.19	15.24	00.07	NA	204650	0.40	1.68	1.28	0.40	1.68	1.28	0.09	1.224
D62	04	02	1111	1936	1318	43.32	15.24	00.07	NA	204500	0.48	1.42	0.94	0.48	1.72	1.24	0.11	1.240
D62	05	04	1111	1936	1319	43.40	15.23	00.05	NA	204500	0.68	1.58	0.90	0.68	1.82	1.14	0.11	1.246
D62	06	04	1111	1936	1319	43.40	15.23	00.05	NA	204500	0.72	1.48	0.76	0.72	1.92	1.20	0.10	1.250
D62	17	03	1111	1937	1321	45.05	15.21	00.02	00.46	204550	0.62	1.70	1.08	0.40	1.78	1.38	0.10	1.258
D62	18	03	1111	1937	1321	45.08	15.22	00.03	00.46	204550	0.68	1.90	1.22	0.68	1.90	1.22	0.11	1.258
D64	85	08	1111	2228	1125	10.08	14.34	-00.07	NA	239425	0.60	1.62	1.62	0.50	1.82	1.62	0.11	1.224
D64	60	07	2222	2252	1450	60.28	14.40	00.20	00.56	275757	NR	NR	NR	0.48	2.21	1.73	0.11	1.102
D65	18	06	1111	2350	1049	11.32	15.26	00.12	NA	239938	0.61	1.58	0.97	0.60	1.84	1.24	0.11	1.229
D65	49	09	1111	0601	1121	16.47	15.23	00.08	NA	227365	0.55	1.66	1.11	0.27	1.91	1.64	0.09	1.238
D66	32	07	1111	0132	1128	19.20	14.38	00.03	NA	225229	0.62	1.73	1.09	0.27	2.03	1.76	0.11	1.232
D66	64	08	4313	0134	1145	24.11	15.37	00.00	00.31	218000	1.01	2.13	1.12	0.53	2.14	1.61	0.11	1.246
D66	74	10	4313	0134	1151	25.21	15.30	00.13	NA	247000	0.82	1.92	1.10	0.66	2.22	1.56	0.08	1.248
D67	21	10	1111	0250	0942	04.47	14.58	00.34	01.16	218400	0.68	0.90	0.22	0.46	1.32	0.86	0.20	1.214
D67	44	09	1111	0305	1203	26.01	15.08	00.23	00.45	215152	0.72	2.00	0.28	0.61	2.06	1.45	0.20	1.244
D68	48	09	1121	0435	1144	24.56	14.53	00.03	NA	218378	0.60	1.91	1.37	0.60	2.08	1.48	0.11	1.238
D68	63	10	1111	0436	1152	26.56	14.40	-00.02	00.22	215339	0.58	1.68	1.10	0.58	1.94	1.96	0.12	1.249
D68	132	10	1112	0439	1217	36.39	14.57	00.10	01.19	207000	0.96	1.78	0.82	0.84	1.92	1.08	0.10	1.258
D68	161	08	2213	0440	1226	40.45	14.54	00.15	01.03	205500	NR	NR	NR	0.39	2.03	1.64	0.11	1.260
D69	07	10	1111	0604	1120	18.11	15.57	00.45	NA	227049	0.54	1.66	1.12	0.54	1.86	1.42	0.11	NA
D69	41	09	1111	0606	1122	23.29	15.52	00.06	NA	217449	1.04	2.00	0.96	1.04	2.16	1.12	0.21	NA
D70	09	09	1111	0736	1126	19.59	14.48	00.31	01.25	222921	0.76	1.82	1.06	0.76	2.02	1.26	0.21	1.238
D70	87	08	1211	0740	1215	35.54	14.34	00.25	01.02	207338	1.36	1.90	0.54	1.20	1.98	0.78	0.09	1.258
D71	08	07	1114	0906	1121	18.55	14.56	00.01	NA	224730	0.94	1.42	0.48	0.80	1.68	0.88	0.11	1.237
D72	23	12	3121	1039	1142	24.21	15.18	-00.10	00.32	216000	NR	NR	NR	0.26	2.04	1.78	0.11	1.247
D72	46	11	1111	1040	1155	27.55	15.24	-00.05	NA	215000	1.00	1.93	0.93	0.72	2.07	1.55	0.09	1.251
D72	74	10	1112	1045	1235	46.39	16.04	00.08	NA	205250	0.69	1.92	1.23	0.65	2.19	1.54	0.21	1.259
D72	84	11	1111	1046	1241	48.18	16.01	00.19	01.08	205000	1.10	1.70	0.60	1.10	2.00	0.80	0.18	1.259
D78	05	10	1111	1247	1210	37.05	15.14	00.01	00.43	206500	NR	NR	NR	1.16	1.96	0.80	0.10	1.248
D78	25	11	1111	1248	1217	40.02	15.17	-00.08	NA	205500	1.18	1.44	0.26	0.52	1.80	1.58	0.09	1.258
D83	10	09	1111	0318	1133	25.33	15.11	00.12	00.21	215000	0.96	1.96	1.00	0.70	1.98	1.28	0.11	1.247
D83	43	41	2111	0319	1151	31.32	14.50	00.19	NA	211000	1.18	1.86	0.68	1.18	2.02	0.84	0.08	1.254
D83	76	10	1211	0320	1257	36.16	14.51	00.23	00.48	207702	0.74	1.92	1.18	0.38	2.02	1.64	0.11	1.257
D85	11	06	1111	0618	1120	21.44	15.35	-00.01	NA	218962	0.94	1.97	1.03	0.69	2.06	1.57	0.19	1.242

TOP SECRET RUFF
NO FOREIGN DISSEM

NPIC/TP-17/64

1. Master (FWD) Panoramic Camera (Continued)

Pass	Frame	Over lap	Cloud	Univ. Time	Sun Time	Solar Elev.	Pitch	Roll	Yaw (All Minus)*	Alt. (yds)	Terrain			Limiting				
											D Min	D Max	Δ	D Min	D Max	Fog	Δ	Exp
D55	51	10	1111	0620	1141	27 47	15 26	00 24	NA	211596	0.42	1.74	1.32	0.41	1.88	1.47	0.11	1 251
D55	83	10	4313	0622	1206	37 37	14 53	00 00	NA	206882	0.85	1.91	1.06	0.69	2.09	1.31	0.09	1 253
D56	28	11	4312	0749	1121	22 32	15 45	00 22	01 02	216000	0.58	1.87	0.99	0.86	2.03	1.17	0.09	1 246
D56	75	09	1111	0752	1153	32 17	14 59	00 32	NA	209000	1.49	1.75	0.26	1.01	1.87	0.86	0.09	1 255
D56	93	09	4412	0753	1200	34 48	15 17	00 27	00 38	207000	0.88	1.72	0.84	0.88	1.72	0.84	0.07	1 254
D57	45	11	1111	0920	1128	24 00	15 04	-00 04	NA	216076	1.18	1.96	0.78	1.18	1.98	0.80	0.11	1 247
D57	84	09	4434	0923	1158	34 39	15 15	-00 00	01 01	207880	1.48	1.84	0.36	1.48	2.08	0.60	0.08	1 256
D94	01	00	1111	2001	1209	44 05	14 56	00 07	NA	205335	0.72	1.72	1.00	0.64	1.92	1.38	0.11	NA
D94	02	00	1111	2001	1209	44 05	14 57	00 07	NA	205335	0.78	1.64	0.86	0.78	1.76	0.98	0.10	1 192
D94	16	08	1111	2001	1212	46 03	15 05	-00 02	NA	206000	0.80	1.70	0.90	0.70	1.50	0.80	0.10	1 249
D94	38	08	1111	2003	1218	49 11	15 11	-00 02	NA	206000	0.80	1.64	0.84	0.40	1.80	1.40	0.10	1 254
D101	10	08	1111	0632	1124	26 08	15 26	-00 02	NA	212250	0.95	1.50	0.55	0.95	1.70	0.85	0.07	1 247
D101	42	10	1112	0633	1137	30 32	15 17	00 20	NA	209326	1.09	1.59	0.50	1.09	1.82	0.73	0.07	1 254
D102	92	09	1121	0804	1159	31 36	15 27	00 06	NA	208685	0.87	1.49	0.62	0.56	1.77	1.21	0.09	1 259
D103	11	11	5334	0932	1059	19 29	15 18	-00 04	NA	218000	0.44	1.75	1.31	0.37	1.95	1.58	0.09	1 249
D103	38	11	3111	0933	1115	23 44	15 32	00 05	NA	214500	0.53	1.85	1.32	0.51	2.03	1.52	0.09	1 255
D103	87	11	1111	0935	1137	31 02	15 18	00 23	NA	209180	1.03	1.68	0.65	0.81	1.80	0.99	0.07	1 260
D103	137	08	2111	0942	1227	60 49	14 19	-00 04	NA	214500	0.81	1.33	0.52	0.34	1.82	1.48	0.07	1 235
D103	150	10	1111	0943	1228	61 34	14 26	-00 06	NA	216000	0.80	1.51	0.71	0.35	1.94	1.59	0.07	1 245
D103	169	10	1111	0944	1232	63 48	14 36	00 07	NA	223000	0.47	1.44	0.87	0.20	1.85	1.65	0.07	1 246
D111	18	11	3111	2135	0940	07 11	14 53	-00 17	NA	230500	0.85	0.95	0.10	0.77	1.44	0.67	0.19	1 236

*All yaw values are determined from stellar readings.

Note NR denotes no reading made

NA denotes not available

Terrain				Limiting			
D Max Range	0.44-2.13	D Min Range	0.27-1.49	D Max Range	1.20-2.50	D Min Range	0.20-1.48
Average D Max	1.66	Average D Min	0.83	Average D Max	1.80	Average D Min	0.67
Gross Fog Range				0.07-0.21			
Average Gross Fog				0.11			

2. Slave (AFT) Panoramic Camera

Pass	Frame	Over lap	Cloud	Univ. Time	Sun Time	Solar Elev.	Pitch (All Minus)	Roll	Yaw (All Minus)*	Alt. (yds)	Terrain			Limiting				
											D Min	D Max	Δ	D Min	D Max	Fog	Δ	Exp
D49	02	NR	3311	2359	1307	NA	13 55	-00 10	NA	NA	0.67	2.24	1.57	0.50	2.55	2.05	0.11	1 248
D49	06	NR	3311	2359	1307	51 43	14 05	-00 07	NA	206360	NR	NR	NR	0.21	2.25	2.04	0.11	1 245
D50	10	05	4114	0116	1029	08 21	15 00	00 12	01 05	244719	0.64	1.23	0.59	0.64	2.06	1.42	0.21	1 214
D50	49	07	1114	0118	1116	14 36	14 52	00 12	01 04	233726	0.75	1.61	0.86	0.58	1.79	1.31	0.11	1 227
D52	63	06	1111	0424	1220	31 51	14 44	00 25	01 42	214782	1.11	1.74	0.63	0.95	2.17	1.22	0.21	1 251
D52	90	04	1111	0425	1229	35 39	15 06	00 35	01 25	208772	1.41	2.21	0.80	1.27	2.25	0.98	0.21	1 254
D53	12	04	1111	0552	1147	21 25	14 08	00 16	01 00	223759	0.79	1.92	1.13	0.67	2.04	1.37	0.21	1 228
D53	62	04	1111	0556	1232	36 48	14 50	00 26	NA	207148	1.23	1.97	0.74	1.23	1.97	0.74	0.21	1 255
D54	09	00	2244	0719	1027	08 26	15 07	00 23	01 07	247955	0.49	0.75	0.26	0.35	0.83	0.43	0.10	1 215
D54	80	06	1111	0723	1147	21 50	14 26	00 53	01 53	222733	1.24	1.87	0.63	1.24	1.93	0.69	0.10	1 239
D54	91	06	1111	0724	1155	23 44	14 28	00 51	01 39	218022	0.75	1.52	0.77	0.75	1.52	0.77	0.07	1 242
D54	107	06	1111	0725	1204	25 49	14 39	00 45	NA	217022	0.60	1.60	1.00	0.49	1.83	1.34	0.05	1 246

TOP SECRET RUFF

NO FOREIGN DISSEM

NPIC/TP-17/64

2. Slace (AFT) Panoramic Camera (Continued)

Pass	Frame	Over- lap	Cloud	Univ. Time	Sun Time	Solar Elev.	Pitch (All Minus)	Roll	Yaw (All Minus)*	Alt. (yds)	Terrain			Limiting				
											D Min	D Max	N	D Min	D Max	N	Fog	Exp
D55	00	NR	5555	0849	1000	0523	15 02	-00 17	00 18	253602	NR	NR	NR	0.33	1.34	1.01	0.19	1.206
D55	10	02	3445	0850	1005	06 02	14 56	-00 19	00 18	246516	NR	NR	NR	0.29	1.84	1.55	0.19	1.210
D55	90	NR	5555	0853	1136	18 23	15 26	00 10	01 02	227802	NR	NR	NR	0.86	1.38	0.52	0.09	1.236
D55	128	04	1111	0855	1159	24 27	14 42	00 10	01 14	219148	1.40	1.98	0.58	1.04	2.06	1.02	0.09	1.234
D55	164	08	1111	0856	1215	30 01	14 00	00 15	01 09	214201	1.20	1.79	0.59	0.73	1.95	1.22	0.08	1.249
D55	260	07	1211	0900	1244	42 38	15 20	00 06	00 57	205000	0.55	1.90	1.35	0.32	2.06	1.74	0.09	1.258
D56	03	02	1111	1025	1149	22 00	15 04	-00 06	00 42	221748	0.27	1.43	1.16	0.27	1.52	1.25	0.08	1.240
D56	61	06	2111	1027	1214	29 52	14 46	-00 07	01 11	213492	1.09	1.57	0.45	0.99	1.87	0.88	0.07	1.251
D61	40	NR	4455	1804	1310	NA	14 24	-00 17	00 53	205581	NR	NR	NR	0.62	1.82	1.20	0.09	1.256
D62	06	03	1111	1936	1314	42 54	14 29	00 08	NA	205000	0.70	1.31	0.61	0.70	1.98	1.28	0.07	1.247
D62	07	03	1111	1936	1315	43 06	14 29	00 08	NA	205000	0.71	1.24	0.53	0.51	1.71	1.20	0.09	1.250
D62	08	04	1111	1936	1317	43 19	14 30	00 07	NA	204650	0.56	1.24	0.68	0.56	1.81	1.25	0.08	1.251
D62	09	04	1111	1936	1318	43 32	14 30	00 07	NA	204500	0.52	1.42	0.90	0.50	1.87	1.57	0.08	1.254
D62	11	03	1111	1936	1319	43 40	14 31	00 05	NA	204500	0.72	1.45	0.73	0.44	1.82	1.38	0.09	1.255
D62	22	02	1111	1937	1321	45 05	14 23	00 02	00 46	204550	0.58	1.71	0.83	0.70	1.78	1.08	0.09	1.256
D62	23	03	1111	1937	1321	45 08	14 22	00 03	00 46	204550	1.01	1.85	0.84	0.40	1.85	1.45	0.09	1.256
D62	27	05	1111	1937	1325	46 48	14 16	00 06	NA	204600	1.12	1.78	0.66	1.12	2.00	0.88	0.19	1.256
D64	41	07	1111	2228	1125	10 08	15 20	-00 07	01 28	239425	0.50	1.78	1.28	0.50	1.78	1.28	0.11	1.224
D64	65	08	2222	2252	1450	60 28	15 14	00 20	00 36	275757	0.58	1.84	1.26	0.30	1.84	1.54	0.06	1.187
D65	24	06	1111	2359	1029	11 32	14 25	00 03	NA	239038	0.41	1.99	1.58	0.41	1.99	1.51	0.11	1.228
D65	34	08	1111	0001	1121	16 47	14 31	00 08	NA	227365	1.49	2.16	0.57	0.89	2.16	1.27	0.19	1.206
D66	69	04	4313	0134	1145	24 11	14 32	00 04	00 31	215000	1.41	1.94	0.53	0.28	1.94	1.66	0.11	1.245
D66	79	08	4313	0134	1151	25 21	14 31	00 19	NA	217000	1.23	2.00	0.17	1.23	2.12	0.89	0.11	1.246
D67	26	06	1111	0259	0942	04 47	14 47	00 25	01 16	248400	0.37	1.03	0.66	0.37	1.39	1.02	0.17	1.214
D67	50	08	1111	0305	1203	26 01	14 41	00 42	00 45	215152	0.38	1.98	1.60	0.38	2.06	1.68	0.07	1.245
D68	54	08	1111	0435	1144	24 36	15 11	-00 02	NA	218378	0.80	1.92	1.12	0.62	2.08	1.46	0.11	1.243
D68	69	09	1111	0436	1152	26 36	15 13	-00 04	00 22	215339	0.68	1.72	1.04	0.68	2.00	1.32	0.07	1.247
D68	128	08	1111	0439	1217	36 39	14 55	00 14	01 19	207000	0.49	1.94	1.45	0.45	1.95	1.50	0.11	1.255
D68	167	07	2213	0440	1226	40 45	15 07	00 12	01 03	205530	0.80	2.02	1.22	0.37	2.05	1.71	0.11	1.257
D69	12	06	1111	0604	1120	18 11	14 03	00 45	NA	227049	0.52	1.78	1.26	0.40	1.85	1.45	0.11	1.251
D69	46	09	1111	0606	1122	23 29	14 08	00 06	NA	217449	0.50	1.71	1.21	0.50	1.79	1.29	0.11	1.254
D70	14	10	1111	0736	1126	19 59	15 01	00 31	01 23	222921	0.55	1.94	1.39	0.55	2.04	1.49	0.21	1.239
D70	101	07	1211	0740	1215	35 54	15 23	00 24	01 02	207338	0.90	1.89	0.99	0.90	1.94	1.04	0.09	1.255
D71	14	07	1111	0906	1121	18 55	14 58	00 01	NA	224730	0.63	1.55	0.92	0.52	1.75	1.23	0.11	1.237
D72	28	11	2121	1039	1142	24 21	14 23	-00 10	00 32	216000	0.33	1.63	1.50	0.27	1.99	1.72	0.11	1.255
D72	52	10	1111	1040	1155	27 55	14 20	-00 02	NA	213000	0.93	2.00	1.07	0.85	2.16	1.31	0.18	1.256
D72	79	10	1112	1045	1235	46 39	13 50	00 11	NA	205250	0.87	1.88	0.91	0.84	2.25	1.41	0.21	1.256
D72	89	10	1111	1046	1241	48 18	13 59	00 25	01 08	205000	1.21	2.07	0.86	1.11	2.18	1.07	0.21	1.256
D78	09	06	1111	1947	1210	37 05	14 46	00 01	00 43	206500	1.70	2.17	0.47	1.25	2.17	0.92	0.11	1.251
D78	30	08	1211	1948	1217	40 02	14 43	-00 08	NA	205500	0.37	1.47	1.10	0.37	2.23	1.86	0.11	1.255
D83	13	09	1111	0518	1133	25 33	14 48	00 05	00 31	215000	1.33	2.03	1.70	0.88	2.07	1.19	0.15	1.246
D83	48	10	2111	0519	1151	31 32	15 08	00 21	NA	211000	0.98	1.79	0.81	0.89	2.10	1.21	0.09	1.251
D83	80	09	1211	0520	1257	36 16	15 03	00 21	00 48	207702	0.49	1.89	1.40	0.24	1.94	1.70	0.11	1.254
D85	16	07	1111	0618	1120	21 44	14 12	-00 03	NA	215962	0.50	1.73	0.93	0.80	2.06	1.26	0.21	1.241
D85	56	09	1111	0620	1141	27 47	14 34	00 24	NA	211596	0.50	1.67	1.17	0.38	1.89	1.31	0.11	1.249
D85	88	11	4312	0622	1206	37 37	14 57	-00 01	NA	200852	0.91	1.67	0.76	0.91	1.67	0.76	0.11	1.254
D86	33	08	4312	0749	1121	22 32	14 18	00 23	01 02	216000	0.45	1.48	1.03	0.45	1.52	1.17	0.07	1.244
D86	80	07	1111	0752	1153	32 17	14 49	00 31	NA	209000	1.71	1.77	0.06	0.90	1.77	0.87	0.07	1.254
D86	98	08	4412	0753	1200	34 48	14 35	00 25	00 38	207000	1.02	1.61	0.59	0.90	1.70	0.86	0.07	1.254
D87	50	09	1111	0920	1128	24 00	14 52	00 00	NA	216976	0.75	1.85	1.10	0.75	1.94	1.19	0.11	1.245
D87	89	08	4434	0923	1158	34 39	14 34	00 08	01 01	207880	1.09	1.87	0.78	1.09	2.11	1.02	0.09	1.254
D94	07	06	1111	2001	1209	44 05	14 53	00 07	NA	203335	0.72	1.62	0.90	0.40	1.69	1.29	0.11	1.248
D94	22	07	1111	2001	1212	46 03	14 45	-00 01	NA	206000	0.55	1.68	1.13	0.50	1.94	1.44	0.11	1.253
D94	45	07	1111	2002	1218	49 11	14 43	-00 01	NA	206000	0.77	1.61	0.54	0.29	1.85	1.56	0.11	1.253
D101	15	08	1111	0632	1124	26 08	14 31	-00 04	NA	212250	1.05	1.48	0.43	1.05	1.62	0.57	0.07	1.246
D101	47	07	1412	0633	1137	30 32	14 37	00 27	NA	209236	0.98	1.68	0.70	0.98	1.82	0.84	0.07	1.254
D102	97	NR	1121	0804	1159	31 36	14 25	00 04	NA	208685	0.82	1.05	0.23	0.46	1.44	0.95	0.07	1.258
D103	16	10	5834	0932	1059	19 29	14 31	-00 03	NA	218000	0.45	1.64	1.19	0.22	1.67	1.45	0.11	1.247
D103	43	10	3111	0933	1115	23 44	14 21	00 07	NA	214500	0.58	1.87	1.29	0.22	1.98	1.76	0.09	1.253
D103	91	10	1111	0935	1137	31 02	14 29	00 24	NA	209180	0.75	1.58	0.83	0.75	1.80	1.05	0.07	1.258

*All yaw values are determined from stellar readings.

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Pass	Frame	Over-lap	Cloud	Univ. Time	Sun Time	Solar Elev.	Pitch (All Minus)	Roll	Yaw (All Minus)*	Alt. (yds)	Terrain			Limiting				
											D Min	D Max	Δ	D Min	D Max	Δ	Fog	Exp
D103	141	05	2111	0942	1227	60 49	15 35	-00 06	NA	214500	0.72	1.41	0.69	0.28	1.93	1.65	0.07	1 247
D103	154	10	1111	0943	1228	61 34	15 26	-00 04	NA	216000	0.87	1.42	0.55	0.35	1.99	1.64	0.07	1 247
D103	173	09	1111	0944	1232	63 48	15 15	-00 11	NA	223000	1.08	1.95	0.87	0.62	2.10	1.48	0.17	1 247
D111	23	10	3111	2135	0940	07 11	15 04	-00 02	NA	230500	0.65	0.91	0.26	0.65	1.25	0.60	0.19	1 235

Note NR denotes no reading made
NA denotes not available

Terrain

D Max Range 0.75-2.24
D Min Range 0.27-1.71
Average D Max 1.71
Average D Min 0.81

Limiting

D Max Range 0.83-2.35
D Min Range 0.21-1.27
Average D Max 1.88
Average D Min 0.63

Gross Fog Range 0.06-0.21
Average Gross Fog 0.12

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APPENDIX C. DENSITY READINGS

1. Stellar Index Camera

Density readings were taken on each pass, EP 1000, with an ET attachment and a 0.5 mm aperture. The values are correlated below.

Pass	Frame	D Min	D Max	Gross Fog	Pass	Frame	D Min	D Max	Gross Fog
D49	01	1.56	2.99	0.34	D68	212	1.04	3.37	0.27
D49	02	0.91	2.88	0.34	D69	213	0.65	3.04	0.27
D49	03	0.93	3.12	0.34	D69	229	0.95	3.27	0.28
D50	04	0.50	2.54	0.31	D70	230	0.75	3.29	0.22
D50	17	0.92	2.87	0.39	D70	244	1.06	3.35	0.24
D52	18	1.64	3.45	0.28	D71	245	0.83	3.23	0.23
D52	34	0.99	3.17	0.28	D71	263	1.05	3.34	0.25
D53	35	0.66	2.87	0.25	D72	264	0.98	3.34	0.24
D53	55	1.42	3.39	0.32	D72	277	0.95	3.20	0.28
D54	56	0.46	2.90	0.28	AT2E	278	NR	NR	0.27
D54	75	0.89	3.29	0.25	D78	277	1.24	3.45	0.29
D55	76	0.37	2.33	0.28	D78	284	NR	NR	0.24
D55	113	1.14	3.30	0.25	D82	285	1.13	3.40	0.26
D56	114	0.90	3.18	0.24	D83	296	1.51	3.61	0.24
D56	123	1.07	3.27	0.25	D85	297	NR	NR	0.24
A56E	124	NR	NR	0.25	D85	312	NR	NR	0.25
A57	125	NR	NR	0.31	D86	313	1.04	2.56	0.25
D61	126	1.24	3.29	0.27	D86	329	1.55	3.48	0.25
D61	131	1.29	3.30	0.24	D87	330	1.12	3.25	0.26
D62	132	1.02	3.21	0.26	D87	348	1.17	3.43	0.35
D62	137	0.69	3.10	0.26	D94	349	NR	NR	0.25
D64	138	0.39	2.98	0.27	D94	355	NR	NR	0.25
D64	148	0.56	2.97	0.30	D101	356	NR	NR	0.25
D65	149	0.56	3.21	0.27	D101	363	NR	NR	0.25
D66	158	0.83	3.23	0.25	D102	364	NR	NR	0.25
D66	159	0.28	1.44	0.27	D102	380	NR	NR	0.25
D66	171	1.00	3.29	0.28	A102E	381	NR	NR	0.25
D67	172	0.32	2.50	0.27	D103	382	NR	NR	0.25
D67	186	0.95	3.10	0.25	D103	409	NR	NR	0.27
D68	187	0.29	2.91	0.24					

Note NR denotes no reading made

D Max Range	1.44-3.61	Average D Max	3.11
D Min Range	0.28-1.81	Average D Min	0.91
Gross Fog Range	0.22-0.39		
Average Gross Fog	0.27		

2. Terrain Index Camera

Density readings were taken on each pass, EP 1000, with an ET attachment and a 0.5 mm aperture. The values are correlated below.

Terrain				Limiting		
Pass	Frame	D Min	D Max	D Min	D Max	Gross Fog
D49	01	NR	NR	0.34	1.73	0.05
D49	02	NR	NR	0.20	1.77	0.10
D49	03	NR	NR	0.13	1.74	0.11
D50	04	0.16	0.67	0.16	0.91	0.10
D50	17	0.15	1.12	0.15	1.12	0.07
D52	18	0.50	1.01	0.30	1.01	0.10
D52	34	0.40	1.47	0.16	1.47	0.07
D53	35	0.17	1.08	0.17	1.08	0.09

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		Terrain		Limiting		
Pass	Frame	D Min	D Max	D Min	D Max	Gross Fog
D53	55	NR	NR	NR	1.58	0.07
D54	64	0.31	0.88	0.31	0.88	0.07
D54	75	0.47	1.35	0.47	1.35	0.07
D55	82	0.28	0.74	0.28	0.87	0.07
D55	113	0.31	0.95	0.31	1.58	0.07
D56	114	0.25	1.10	0.25	1.13	0.07
D56	123	0.26	1.00	0.26	1.10	0.07
A56E	124	NR	NR	NR	NR	0.07
A56	125	NR	NR	NR	NR	0.07
D61	126	NR	NR	0.66	1.29	0.08
D61	131	NR	NR	0.43	1.54	0.08
D62	132	0.25	0.98	0.25	0.98	0.10
D62	137	0.14	0.91	0.14	0.91	0.10
D64	142	0.18	0.70	0.18	0.85	0.12
D64	148	NR	NR	0.15	1.47	0.11
D65	149	0.34	0.67	0.20	0.70	0.11
D65	156	0.53	1.05	NR	NR	0.11
D66	163	0.33	1.15	0.22	1.15	0.07
D66	169	0.40	1.35	0.18	1.36	0.07
D67	177	0.23	1.21	0.23	1.21	0.07
D67	185	0.23	1.09	0.17	1.18	0.08
D68	193	0.25	1.29	0.25	1.29	0.07
D68	212	0.60	1.22	0.52	1.24	0.07
D69	213	0.20	1.02	0.20	1.06	0.07
D69	229	0.29	1.28	0.29	1.48	0.07
D70	230	0.18	1.31	0.18	1.31	0.07
D70	244	0.30	1.50	0.30	1.50	0.07
D71	245	0.33	0.87	0.33	1.14	0.07
D71	263	0.34	1.09	0.13	1.46	0.07
D72	264	0.23	1.12	0.14	1.12	0.07
D72	277	0.31	1.06	0.31	1.06	0.07
A72E	278	NR	NR	NR	NR	0.07
D78	279	0.44	1.49	0.44	1.49	0.07
D78	284	NR	NR	NR	NR	0.07
D83	285	0.17	1.17	0.17	1.17	0.07
D83	296	0.27	1.10	0.15	1.37	0.07
D85	297	0.22	1.17	0.22	1.17	0.07
D85	312	0.39	1.31	0.26	1.31	0.07
D86	319	0.27	1.17	0.27	1.17	0.07
D86	326	0.49	1.24	0.49	1.24	0.07
D87	330	0.24	0.90	0.24	0.90	0.07
D87	345	0.27	1.58	0.27	1.58	0.07
D94	349	0.17	1.08	0.17	1.08	0.07
D94	355	0.27	1.05	0.17	1.05	0.07
D101	356	0.28	1.22	0.28	1.22	0.07
D101	363	0.58	1.30	0.58	1.30	0.07
D102	372	0.31	0.65	0.31	1.07	0.07
D102	380	0.23	1.64	0.23	1.64	0.07
A103E	381	NR	NR	NR	NR	0.07
D103	409	0.58	1.17	0.22	1.17	0.07
A104E	410	NR	NR	NR	NR	0.07
D111	411	NR	NR	0.07	0.30	0.07
D111	425	0.29	0.82	0.29	0.82	0.07

Note NR denotes no reading made

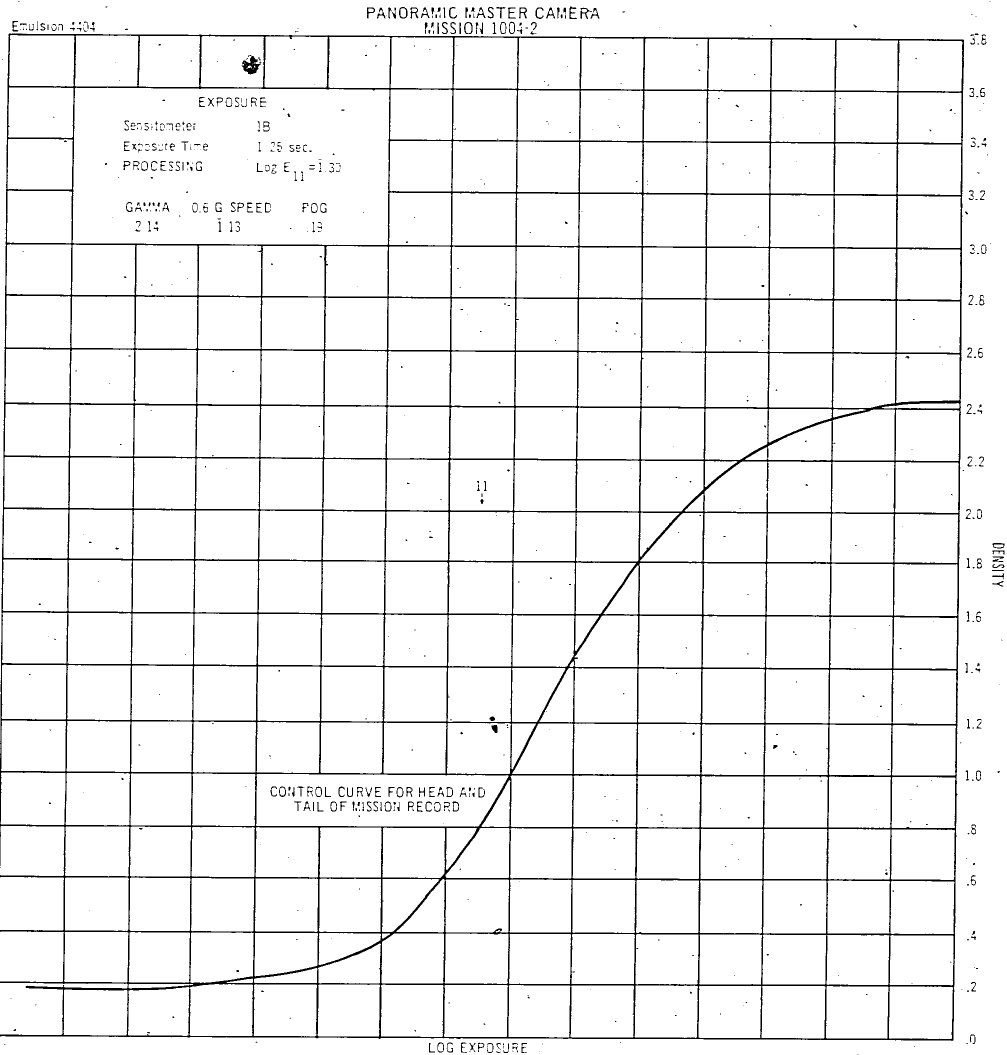
Terrain
D Max Range 0.65-1.58
D Min Range 0.14-0.69
Average D Max 1.11
Average D Min 0.20

Gross Fog Range 0.05-0.11
Average Gross Fog 0.08

Limiting
D Max Range 0.30-1.77
D Min Range 0.07-0.66
Average D Max 1.22
Average D Min 0.26

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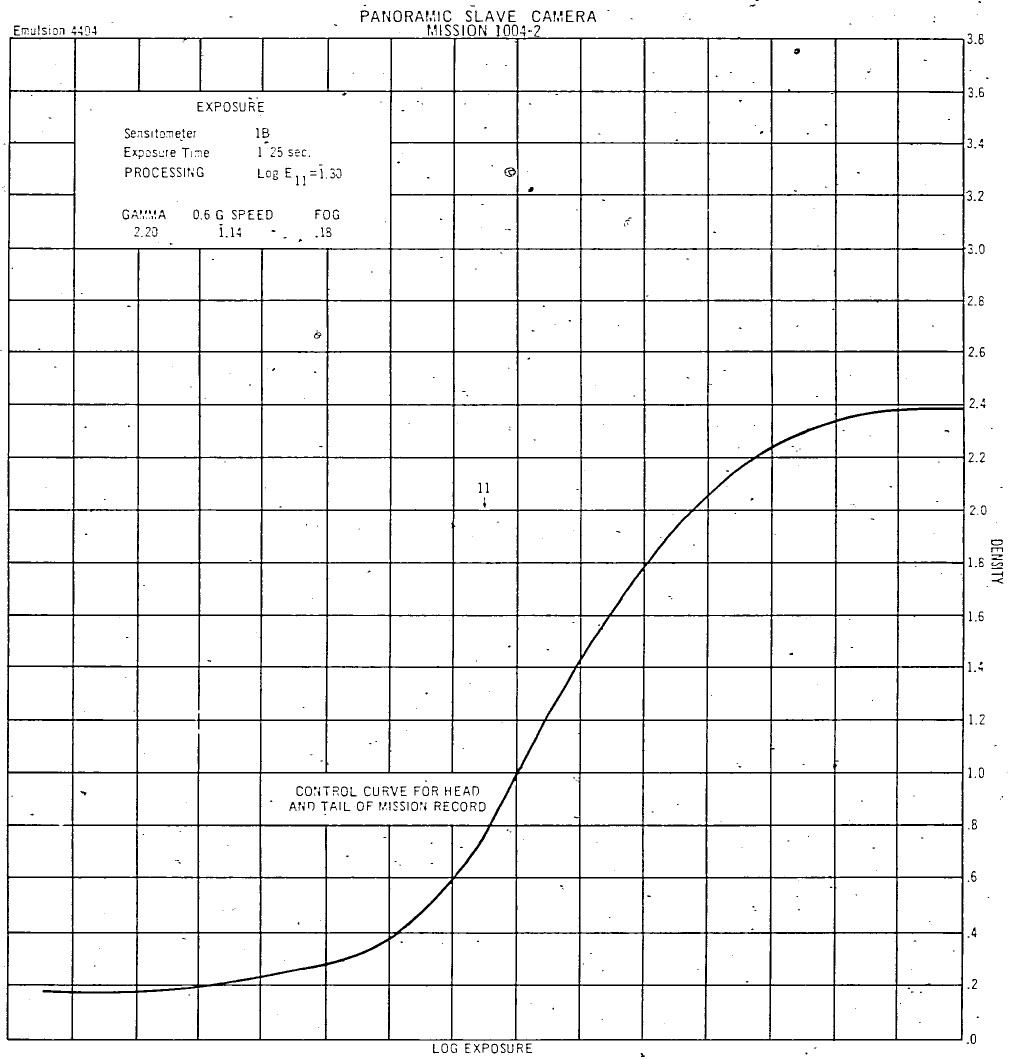
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NO FOREIGN DISSEM

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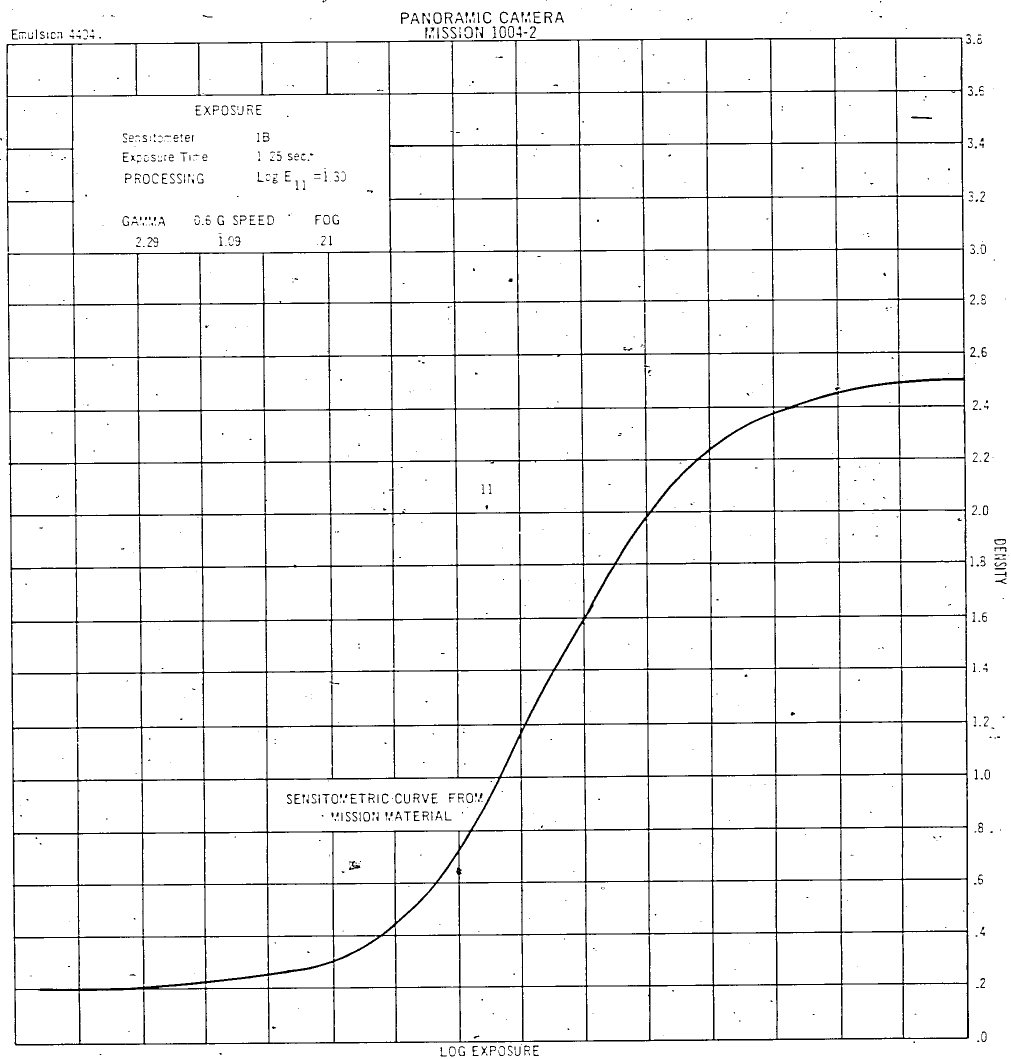


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TOP SECRET RUFF
NO FOREIGN DISSEM

TOP SECRET RUFF
NO FOREIGN DISSEM

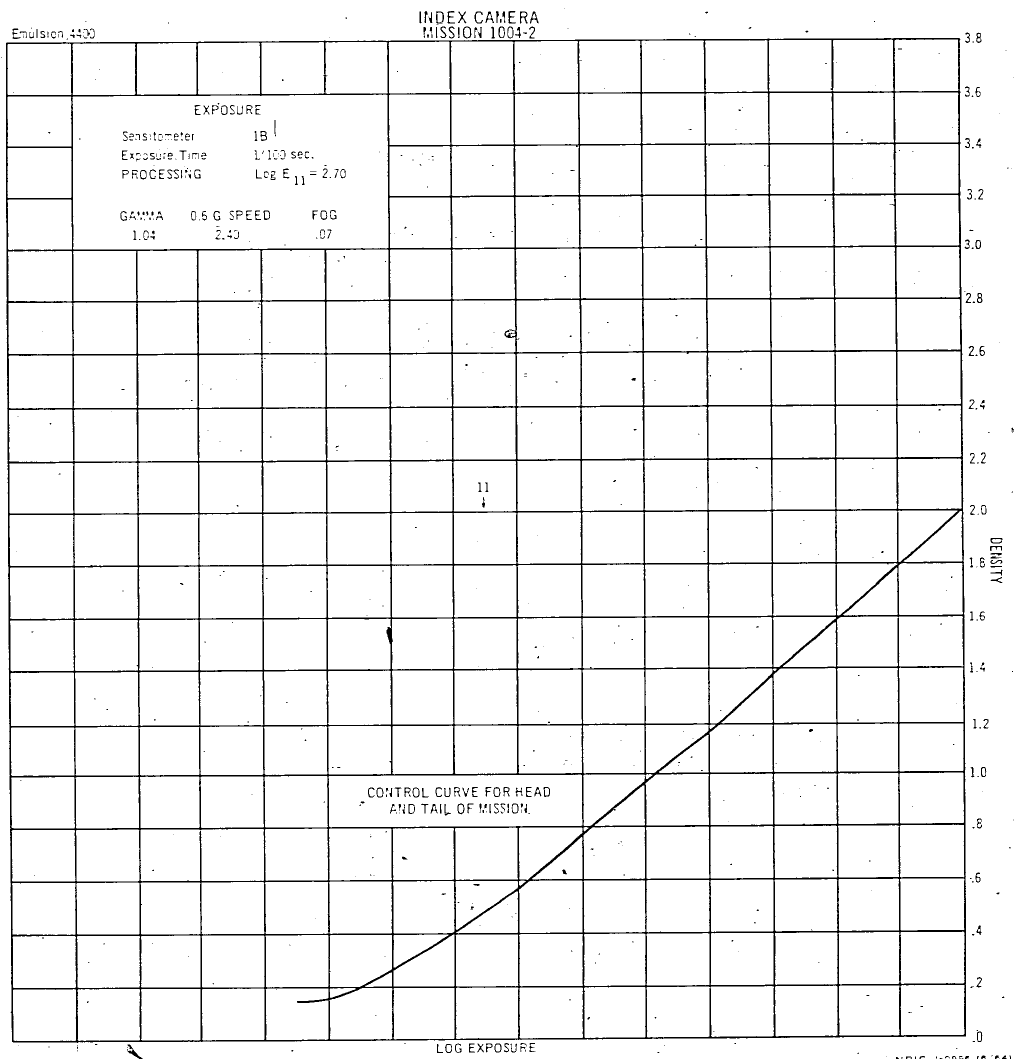
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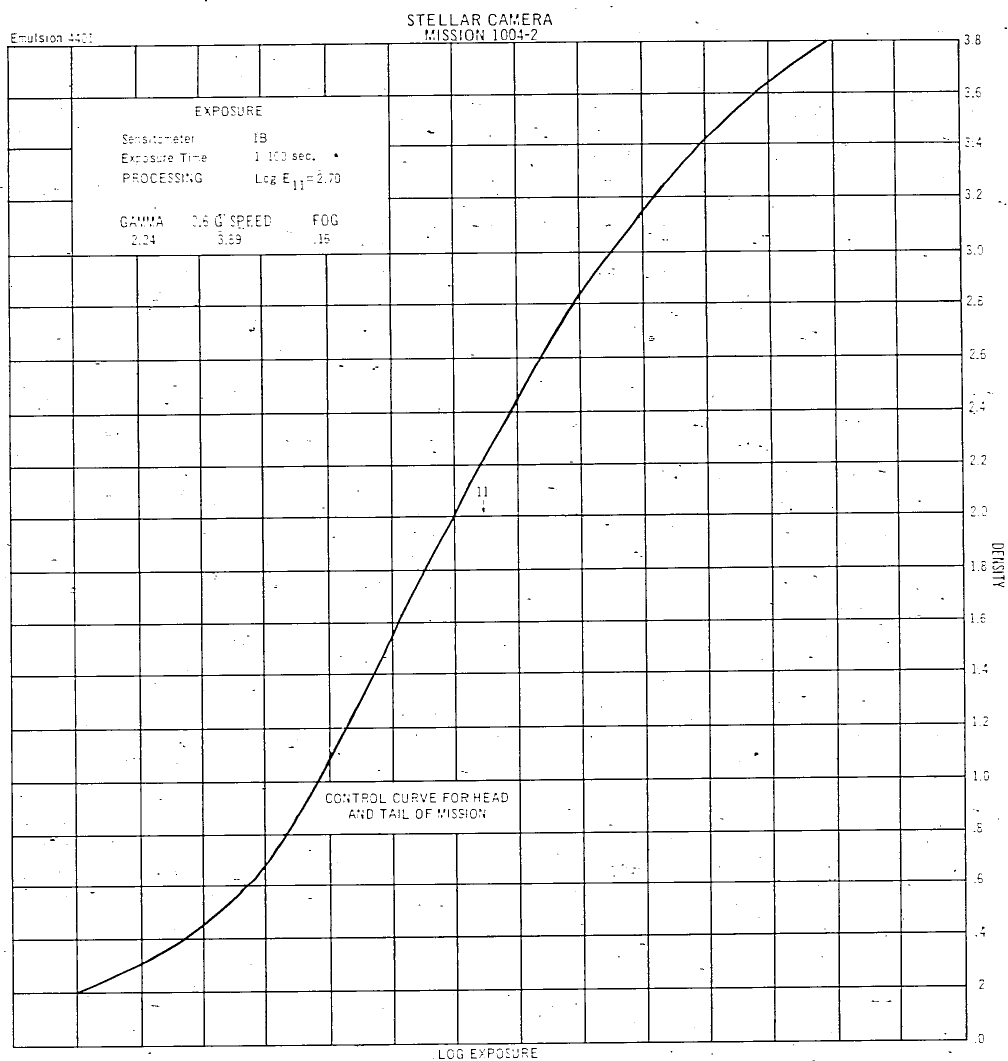
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APPENDIX D. EDGE SPREAD FUNCTION

In an attempt to establish an objective measurement of image quality in photography, the technique of obtaining the spread function from microdensitometric edge traces is being investigated. The spread function curve represents the whole photographic system, and is a summation of the separate elements: lens, film, and uncompensated image motion due to vibration, velocity, roll, pitch, yaw, and aerial turbulence.

To assign a single number to the spread function, the width is measured at 50 percent amplitude. This number, usually expressed in microns, may be converted by use of the scale factors to ground distance in feet.

Edges meeting the criteria described below have been found in domestic passes of missions in the same frame as resolution targets and have been scanned. The ground distance in feet, thus determined, has been close to that determined from the resolution target. Although the techniques used are not refined and are considered to be still in the development stage, the potential of this type of objective analysis should be realized. The two examples of edge scans and their respective spread functions are included as a preview of this type quality analysis.

Any optical image can be thought of as being composed of an infinite number of image points (or lines) of light, each being conjugate with points (or lines) in the object. While the object points can be infinitesimal light sources, the image points are always mounds or distributions of light having finite size. This blurring of light points in a photographic system comes from diffraction and aberration in the lens, light spreading and diffusion in the emulsion, and image motion caused by camera movement and atmospheric shimmering. The fundamental building block of the image then is the distribution of light in any of the image points. This

distribution is called the spread function of the photographic system.

Lamberts and others have explained the mathematical and experimental correspondence of a sharp edge and its spread function. An analogy exists in the techniques of studying electrical system response. The analysis requires that the source or object fulfill the conditions of a unit step function, i.e. exist for an appreciable time or distance at a fixed signal level and instantaneously or abruptly change to a new level which is maintained for an appreciable time or distance. The spread function is obtained by differentiating the signal output curve point by point (i.e. measuring the rate of change or signal with time or distance, and plotting signal amplitude versus time or distance).

As a starting point the mission is examined to locate examples of best photography with edges long enough and straight enough for use in the microdensitometer, and having uniform density on each side of the edge to fulfill the conditions of a unit step function. This requirement is usually achieved by rooftops of buildings in large-scale photography, and aircraft runways in small-scale photographs.

The microdensitometer used is a Joyce-Lobel Double Beam Model III C. It is used with an effective slit of one micron by 125 microns. The recording table and sample table are directly linked with a ratio arm of 1000:1. The speed of the scan is variable and is determined by the amount of pen deflection (as the pen is deflected the speed decreases giving the pen time to reach its maximum response). The chart thus produced represents a plot of chart displacement versus distance. This plot is manually smoothed by the analyst and is a judgment of what the edge would be if grain and other anomalies were absent.

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The data reduction is done manually at present, but the feasibility of using the UNIVAC 490 computer is being investigated. The microdensitometer calibration curve (chart displacement to density) is used to determine the densities at equal distance increments along the trace. The D Log E curve for the material (density to log exposure) is used to determine the Log E and therefore the exposure required to produce the determined densities. The values

of E are plotted against the distance across the edge to produce the original scene reflectance distribution as recorded in the negative. The final step is a determination and plotting of the slope of this curve (dE/dX) versus distance, point by point. This last plot is the spread function for the whole photographic system.

The width of the spread function curve is measured at 50 percent of maximum amplitude and is indicated on the enclosed traces.

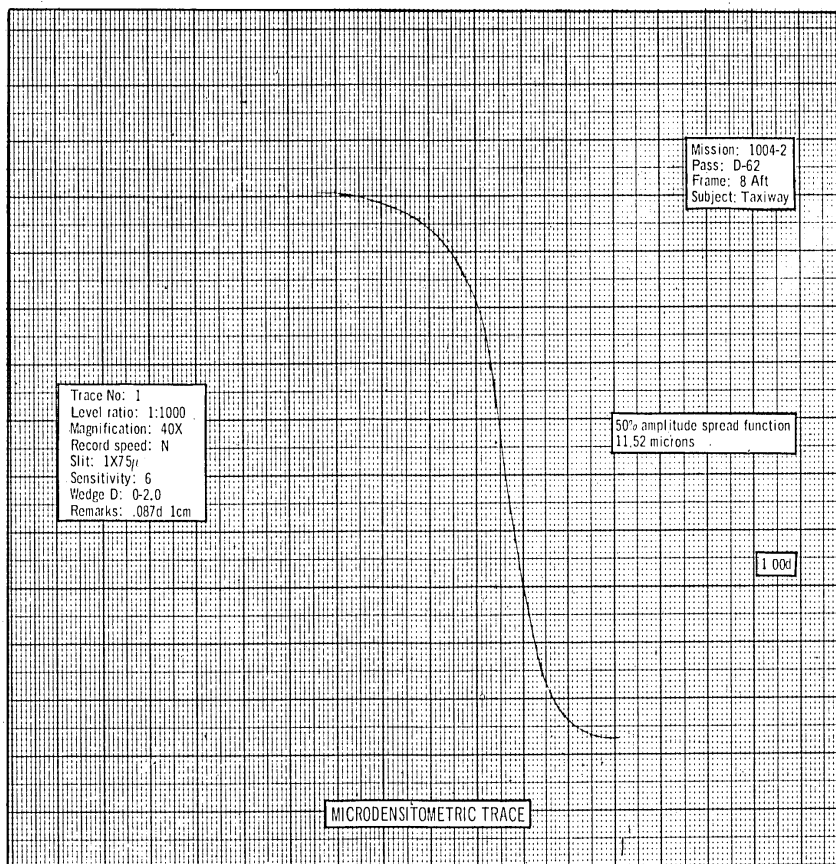
- 25 -

TOP SECRET RUFF

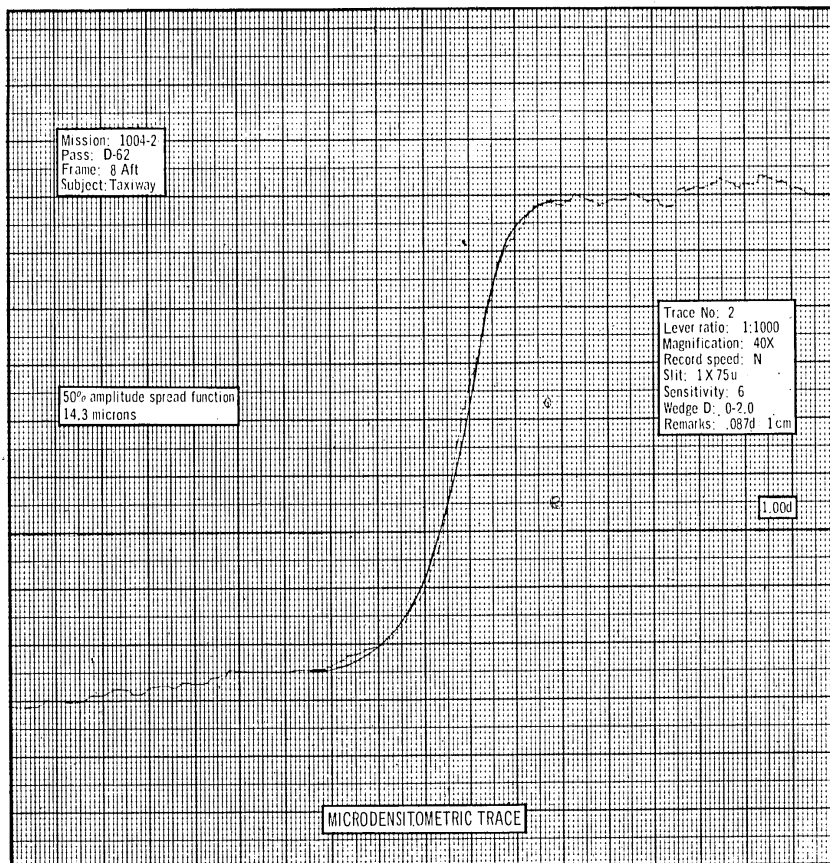
NO FOREIGN DISSEM

NPIC/TP-17/64

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NO FOREIGN DISSEM



TOP SECRET RUFF
NO FOREIGN DISSEM



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TOP SECRET RUFF
NO FOREIGN DISSEM

TOP SECRET RUFF
NO FOREIGN DISSEM

NPIC/TP-17/64

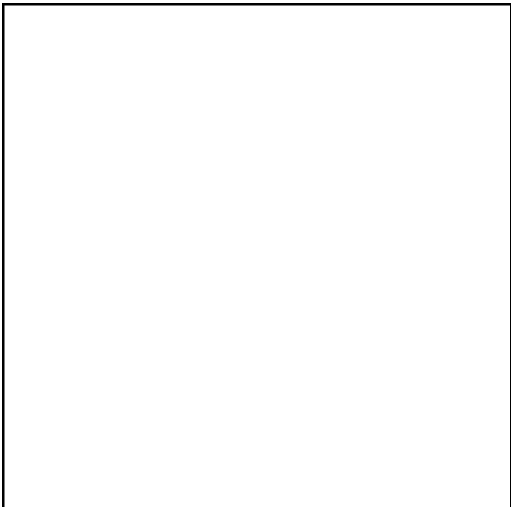
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25X1

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APPENDIX E. MISSION COVERAGE STATISTICS

1. Plottable Coverage: The following is a summary of plottable coverage for this mission given in linear nautical miles (ln/nm) and in square nautical miles (sq/nm). The figures are the sum of both master and slave photography, and exclude coverage which is entirely over water or completely cloud covered.



2. Cloud Cover: This statistical analysis of cloud cover on Mission 1004-2 is based on cloud cover per quarter segment of each frame of photography. The data are obtained by analysts trained in estimating cloud cover by designated categories.

Five cloud categories have been formulated for use on this photography. These categories allow for the wide latitude of cloud-cover conditions commonly found on a frame of this photography.

In Table 1, a mean cloud percentage value has been calculated for each category for use in determining a combined cloud-cover percentage for all operational passes of the mission.

The occurrences of each cloud category within an operational pass is expressed as a percentage and appears in Table 2. Each percentage is a ratio of the number of occurrences of a given cloud-cover category to the total number of cloud observations in a photographic pass. For example: if the number of category 1 occurrences in a given pass is 200 out of a total of 1000 (250 frames x 4 quarters), all categories combined, then 20 percent of the pass would be as in category 1.

A cloud-cover percentage per pass is included in the last column of Table 2 under "cloud-cover percentage per pass." This value is determined by the summation of the products category percentage in each pass and the mean cloud percentage for that category as established in Table 1. For example: it is determined that the following percentages exist in a given pass:

20 percent	Category 1
15 percent	Category 2
30 percent	Category 3
25 percent	Category 4
10 percent	Category 5

Then, by using the mean cloud percentage established in Table 1, the following computations are made:

0.20×5.0	$=$	1.00 percent
0.15×17.5	$=$	2.63 percent
0.30×35.0	$=$	11.40 percent
0.25×75.0	$=$	18.75 percent
0.10×100.0	$=$	10.00 percent
TOTAL		43.78 percent

Hence, 43.8 percent of this pass is cloud covered.

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NO FOREIGN DISSEM

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Table 1. Cloud-Cover Categories.

Category Number	Percent of Cloud Cover	Description	Mean Cloud Percentage
1	Less than 10	Clear	5
2	10 - 25	Small Scattered Clouds	17.5
3	26 - 50	Large Scattered Clouds	35
4	51 - 99	Broken or Connected Clouds	75
5	100	Complete Overcast	100

Percentage of Cloud Cover Categories by Passes

Pass Number	1	2	3	4	5	Cloud-Cover Percentage Per Pass
50D	60.6	15.5	12.5	8.1	0.0	17.2
52D	55.9	8.5	3.9	1.4	0.0	5.4
53D	31.3	5.7	5.4	7.5	50.1	60.4
54D	62.2	7.3	9.1	11.5	9.6	26.3
55D	28.5	20.5	14.9	24.6	10.9	40.1
56D	40.1	10.9	13.7	21.6	13.7	39.0
64D	21.7	35.6	22.5	13.9	3.0	29.9
65D	60.3	3.0	4.7	23.3	5.7	31.5
66D	44.9	13.7	20.5	20.9	0.0	25.1
67D	69.5	4.6	5.7	19.9	0.0	21.3
68D	55.3	15.9	9.0	10.9	2.9	20.7
69D	72.3	19.7	5.9	2.1	0.0	10.9
70D	62.7	10.4	4.0	20.4	2.5	24.3
71D	10.7	7.5	11.4	22.2	45.2	71.0
72D	56.3	20.3	15.6	6.7	1.1	18.4
83D	79.0	10.2	6.2	4.6	0.0	11.5
85D	65.3	17.3	9.1	8.1	0.2	16.0
86D	47.2	6.4	3.4	17.6	25.4	43.4
87D	30.4	9.9	11.4	21.5	26.5	50.5
101D	47.9	40.6	4.5	6.6	0.4	16.5
102D	40.5	9.5	6.2	24.2	19.0	43.3
103D	39.5	14.3	10.9	16.5	15.5	39.5
111D	35.6	37.1	9.3	5.0	0.0	16.2
112D	12.0	5.5	5.6	71.3	2.3	60.0
	45.2*	14.3*	9.6*	15.6*	12.3*	32.5**

*Average Percentage by Category for Mission.
**Overall Mission Cloud Cover Percentage.

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NO FOREIGN DISSEM

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25X1

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PASS	DAY	MO	YR
32A	20	04	62

TOP SECRET
SPECIAL HANDLING REQUIRED

FRAME	Z TIME			TIME Diff milsec	CAMERA NADIR			FORMAT CENTER			ALTITUDE (ft)	VELOCITY (ft per sec)	AZIMUTH deg min	SUN ANGLE deg min	PITCH deg min	ROLL deg min
	hr	min	sec		Latitude deg min	Longitude deg min		Latitude deg min	Longitude deg min							
1	01	29	27.517		49 51.54N	076 25.04E		49 50N	076 25E		1235424	23351	023 51	14 47		
2	01	29	28.086	5873	50 12.12N	076 44.10E		49 30N	076 44E		1235456	23337	024 05	14 57		
3	01	29	28.981	5595	50 31.70N	076 57.80E		49 50N	076 57E		1247646	23343	024 17	15 06		
4	01	29	44.296	5315	50 50.28N	077 11.16E		50 30N	077 11E		1244950	23349	024 30	15 16		
5	01	29	49.566	5273	51 08.65N	077 24.91E		50 24N	077 24E		1242745	23355	024 42	15 25		
6	01	29	54.746	5135	51 26.73N	077 37.82E		50 42N	077 37E		1239673	23350	024 55	15 33		
7	01	29	59.531	5155	51 44.67N	077 51.27E		51 03N	077 51E		1237061	23366	025 07	15 42		
8	01	30	05.841	5143	52 02.93N	078 04.87E		51 18N	078 04E		1236455	23371	025 20	15 51		
9	01	30	13.136	5095	52 20.23N	078 18.56E		51 30N	078 18E		1231034	23377	025 33	16 00		
10	01	30	19.201	5065	52 37.74N	078 32.36E		51 50N	078 32E		1229295	23382	025 46	16 08		
11	01	30	24.231	5230	52 55.14N	078 46.28E		52 11N	078 46E		1226737	23388	025 59	16 17		
12	01	30	29.251	5023	53 12.47N	079 00.37E		52 29N	079 00E		1224192	23393	026 12	16 25		
13	01	30	33.221	4879	53 29.59N	079 14.53E		52 45N	079 14E		1221651	23399	026 26	16 33		
14	01	30	38.176	4955	53 46.64N	079 28.36E		53 03N	079 28E		1219125	23404	026 39	16 42		
15	01	30	43.096	4925	54 03.53N	079 43.30E		53 20N	079 43E		1216615	23409	026 53	16 50		
16	01	30	44.996	4930	54 21.32N	079 57.89E		53 37N	079 57E		1214116	23415	027 07	16 58		
17	01	30	49.861	4865	54 38.97N	080 12.60E		53 54N	080 12E		1211620	23420	027 21	17 06		
18	01	30	54.691	4833	54 56.46N	080 27.43E		54 11N	080 27E		1209155	23425	027 35	17 14		
19	01	30	59.501	4812	55 09.35N	080 42.41E		54 27N	080 42E		1206530	23431	027 49	17 22		
20	01	31	04.331	4803	55 26.17N	080 57.35E		54 44N	080 57E		1204041	23436	028 04	17 30		
21	01	31	09.871	4770	55 42.36N	081 12.95E		55 03N	081 12E		1201797	23441	028 18	17 38		
22	01	31	13.631	4743	55 58.47N	081 28.41E		55 19N	081 28E		1199587	23446	028 32	17 45		
23	01	31	18.562	4730	56 14.46N	081 44.36E		55 32N	081 44E		1196938	23452	028 46	17 52		
24	01	31	23.273	4715	56 31.35N	081 59.59E		55 45N	081 59E		1194312	23457	029 03	18 01		
25	01	31	27.966	4699	56 48.13N	082 15.00E		55 59N	082 15E		1191864	23462	029 19	18 08		
26	01	31	32.642	4675	57 01.32N	082 32.87E		56 16N	082 32E		1189785	23467	029 34	18 16		
27	01	31	37.386	4645	57 17.37N	082 48.40E		56 30N	082 48E		1187316	23472	029 50	18 23		
28	01	31	41.926	4640	57 32.86N	083 04.36E		56 42N	083 04E		1184852	23477	030 06	18 31		
29	01	31	46.551	4655	57 48.28N	083 21.85E		57 07N	083 21E		1182561	23482	030 22	18 38		
30	01	31	51.131	4639	58 03.48N	083 38.50E		57 23N	083 38E		1180194	23487	030 38	18 45		
31	01	31	55.696	4565	58 18.61N	083 55.52E		57 38N	083 55E		1177844	23493	030 55	18 53		
32	01	32	00.256	4533	58 33.68N	084 12.94E		57 53N	084 12E		1175495	23498	031 11	19 00		
33	01	32	04.836	4550	58 48.67N	084 30.47E		58 09N	084 30E		1173191	23503	031 28	19 07		
34	01	32	09.341	4535	59 03.58N	084 48.22E		58 24N	084 48E		1170813	23508	031 45	19 14		
35	01	32	13.356	4515	59 18.37N	085 06.17E		58 39N	085 06E		1168486	23513	032 03	19 21		
36	01	32	18.366	4510	59 33.18N	085 24.36E		58 54N	085 24E		1166160	23518	032 20	19 28		
37	01	32	22.852	4485	59 47.71N	085 42.78E		59 09N	085 42E		1163846	23523	032 36	19 35		
38	01	32	27.326	4475	60 02.23N	086 01.42E		59 23N	086 01E		1161537	23528	032 56	19 42		
39	01	32	31.731	4455	60 16.65N	086 20.27E		59 38N	086 20E		1159237	23533	033 15	19 49		
40	01	32	36.227	4445	60 30.98N	086 39.30E		59 52N	086 39E		1156940	23538	033 33	19 56		
41	01	32	40.646	4420	60 45.19N	086 58.68E		60 07N	086 58E		1154655	23543	033 52	20 03		
42	01	32	45.862	4415	60 59.33N	087 18.26E		60 21N	087 18E		1152384	23547	034 11	20 09		
43	01	32	49.466	4405	61 13.38N	087 38.12E		60 32N	087 38E		1150135	23552	034 30	20 16		

PASS	DAY	MO	YR
33A	20	04	62

TOP SECRET
SPECIAL HANDLING REQUIRED

FRAME	Z TIME			TIME Diff mil sec	CAMERA NADIR			FORMAT CENTER			ALTITUDE (ft)	VELOCITY (ft per sec)	AZIMUTH		SUN ANGLE		PITCH		ROLL	
	hr	min	sec		Latitude deg	Longitude deg	min	Latitude deg	Longitude deg	min			deg	min	deg	min	deg	min	deg	min
1	03	01	59.267		52	58.99N	055	51.50E	52	27N	055	51E	1222777	23396	025	56	16	08		
2	03	02	00.457	5790	53	18.99N	055	51.50E	52	27N	055	51E	1222801	23396	026	11	16	10		
3	03	02	10.392	5335	53	29.97N	056	06.49E	52	40N	056	06E	1223115	23417	026	35	16	27		
4	03	02	15.896	5235	53	47.28N	056	21.55E	53	04N	056	21E	1217442	23430	026	40	16	26		
5	03	02	20.767	5179	54	05.03N	056	36.74E	53	22N	056	36E	1214885	23415	026	54	16	44		
6	03	02	25.686	5120	54	22.58N	056	52.82E	53	39N	056	52E	1212212	23419	027	09	16	03		
7	03	02	30.961	5075	54	39.94N	057	07.48E	53	57N	057	07E	1210623	23434	027	23	17	01		
8	03	02	35.901	5033	54	57.11N	057	22.09E	54	14N	057	22E	1217849	23430	027	38	17	10		
9	03	02	40.996	5000	55	14.15N	057	38.54E	54	32N	057	38E	1214649	23435	027	53	17	18		
10	03	02	45.971	4975	55	31.06N	057	54.54E	54	49N	057	54E	1211942	23441	028	08	17	26		
11	03	02	50.926	4955	55	47.37N	058	18.37E	55	06N	058	18E	1199465	23446	028	23	17	34		
12	03	02	55.836	4913	56	04.49N	058	26.41E	55	22N	058	26E	1196881	23452	028	39	17	42		
13	03	03	00.736	4931	56	21.03N	058	42.72E	55	39N	058	42E	1194276	23457	028	54	17	50		
14	03	03	05.612	4865	56	37.42N	058	59.17E	56	06N	058	59E	1191800	23462	029	10	17	58		
15	03	03	10.451	4850	56	53.72N	059	15.32E	56	12N	059	15E	1189191	23468	029	26	18	06		
16	03	03	15.267	4815	57	09.36N	059	22.02E	56	30N	059	22E	1186916	23473	029	42	18	14		
17	03	03	20.166	4800	57	25.91N	059	48.64E	56	48N	059	48E	1184452	23478	029	59	18	22		
18	03	03	24.826	4765	57	41.78N	060	06.78E	57	01N	060	06E	1182031	23484	030	15	18	30		
19	03	03	29.576	4750	57	57.58N	060	24.15E	57	17N	060	24E	1179562	23489	030	32	18	37		
20	03	03	34.286	4710	58	13.31N	060	51.69E	57	35N	060	51E	1177155	23494	030	49	18	45		
21	03	03	38.986	4700	58	28.76N	060	59.44E	57	48N	060	59E	1174720	23499	031	16	18	52		
22	03	03	43.666	4680	58	44.28N	061	17.35E	58	04N	061	17E	1172318	23504	031	33	19	00		
23	03	03	48.326	4660	58	59.52N	061	35.91E	58	20N	061	35E	1169913	23510	031	41	19	07		
24	03	03	52.961	4635	59	14.72N	061	55.07E	58	38N	061	55E	1167522	23515	031	58	19	14		
25	03	03	57.896	4635	59	29.88N	062	12.52E	58	56N	062	12E	1165133	23520	032	12	19	22		
26	03	04	02.196	4620	59	44.87N	062	31.32E	59	04N	062	31E	1162762	23525	032	35	19	29		
27	03	04	06.796	4600	59	59.61N	062	50.43E	59	21N	062	50E	1160393	23531	032	53	19	36		
28	03	04	11.536	4570	60	14.61N	063	09.73E	59	39N	063	09E	1158033	23535	033	12	19	43		
29	03	04	16.526	4560	60	29.32N	063	28.29E	59	51N	063	29E	1155681	23540	033	31	19	50		
30	03	04	20.456	4530	60	43.89N	063	46.04E	60	08N	063	46E	1153345	23545	033	50	19	57		
31	03	04	24.977	4520	60	58.37N	064	09.07E	60	26N	064	09E	1151011	23550	034	18	20	04		
32	03	04	29.471	4495	61	12.71N	064	29.32E	60	44N	064	29E	1148698	23555	034	38	20	11		
33	03	04	33.961	4490	61	26.95N	064	49.67E	60	59N	064	49E	1146372	23560	034	58	20	18		
34	03	04	38.426	4465	61	41.13N	065	18.63E	61	04N	065	18E	1144067	23565	035	18	20	25		
35	03	04	42.886	4460	61	55.28N	065	31.73E	61	18N	065	31E	1141764	23570	035	38	20	31		
36	03	04	47.321	4435	62	09.14N	065	53.03E	61	32N	065	53E	1139474	23575	035	51	20	38		
37	03	04	51.761	4445	62	23.40N	066	16.72E	61	48N	066	16E	1137183	23580	036	12	20	45		
38	03	04	56.176	4415	62	36.76N	066	36.64E	62	00N	066	36E	1134899	23585	036	34	20	51		
39	03	05	00.581	4405	62	50.44N	066	58.87E	62	14N	066	58E	1132625	23590	036	56	20	58		
40	03	05	04.966	4385	63	03.98N	067	21.36E	62	28N	067	21E	1130360	23595	037	17	21	04		
41	03	05	09.246	4380	63	17.45N	067	44.28E	62	42N	067	44E	1128095	23600	037	40	21	11		
42	03	05	13.696	4350	63	30.73N	068	07.26E	62	56N	068	07E	1125831	23605	038	02	21	17		
43	03	05	18.041	4345	63	43.95N	068	20.66E	63	09N	068	20E	1123567	23610	038	25	21	24		
44	03	05	22.366	4325	63	57.04N	068	34.37E	63	22N	068	34E	1121374	23615	038	49	21	30		
45	03	05	26.676	4310	64	10.01N	069	18.37E	63	36N	069	18E	1119163	23619	039	12	21	36		
46	03	05	30.971	4295	64	22.87N	069	42.68E	63	48N	069	42E	1116951	23624	039	36	21	42		
47	03	05	35.261	4290	64	35.64N	070	07.36E	64	01N	070	07E	1114716	23629	040	08	21	49		

PASS	DAY	MO	YR
33A	22	04	62

TOP SECRET
SPECIAL HANDLING REQUIRED

FRAME	Z TIME			TIME Diff millsec	CAMERA NADIR		FORMAT CENTER		ALTITUDE (ft)	VELOCITY (ft per sec)	AZIMUTH		SUN ANGLE		PITCH		ROLL	
	hr	min	sec		Latitude deg min	Longitude deg min	Latitude deg min	Longitude deg min			deg min	deg min	deg min	deg min	deg min	deg min	deg min	deg min
48	03	05	39.586	4275	64 48.30N	070 52.37E	64 14N	070 52E	1112509	23634	041 25	21 55						
49	03	05	43.612	4275	65 39.80N	070 57.79E	64 17N	070 57E	1112503	23639	041 50	22 41						
50	03	05	48.062	4259	65 13.31N	071 23.40E	64 45N	071 23E	1103110	23643	041 15	22 07						
51	03	05	52.307	4265	65 25.64N	071 49.57E	65 02N	071 49E	1105520	23646	041 41	22 13						
52	03	05	56.551	4225	65 37.04N	072 15.96E	65 15N	072 15E	1105740	23653	042 17	22 19						
53	03	06	00.751	4220	65 49.34N	072 42.73E	65 17N	072 42E	1101064	23656	042 33	22 25						
54	03	06	04.951	4200	66 01.91N	073 09.88E	65 29N	073 09E	1099850	23662	043 00	22 31						
55	03	06	09.146	4195	66 13.77N	073 37.41E	65 42N	073 37E	1097236	23667	043 27	22 36						
56	03	06	13.316	4175	66 25.47N	074 05.22E	65 54N	074 05E	1095007	23672	043 54	22 42						
57	03	06	17.491	4175	66 37.11N	074 33.55E	66 06N	074 33E	1092937	23677	044 22	22 48						
58	03	06	21.642	4150	66 48.58N	075 02.15E	66 17N	075 02E	1090759	23681	044 58	22 54						
59	03	06	25.791	4150	66 59.06N	075 31.19E	66 29N	075 31E	1088563	23684	045 19	22 59						
60	03	06	29.926	4135	67 11.24N	076 00.65E	66 41N	076 00E	1086333	23691	045 48	23 05						
61	03	06	34.057	4135	67 22.34N	076 30.51E	66 53N	076 30E	1084010	23695	046 16	23 10						
62	03	06	38.176	4120	67 33.35N	077 00.81E	67 05N	077 00E	1082291	23700	046 47	23 16						
63	03	06	42.286	4110	67 44.25N	077 31.50E	67 16N	077 31E	1080170	23704	047 18	23 21						
64	03	06	46.381	4095	67 54.97N	078 02.63E	67 26N	078 02E	1078074	23710	047 48	23 27						
65	03	06	50.471	4090	68 05.60N	078 34.18E	67 37N	078 34E	1075975	23714	048 20	23 32						
66	03	06	54.549	4075	68 16.38N	079 06.12E	67 47N	079 06E	1073832	23718	048 51	23 38						
67	03	06	58.616	4070	68 26.43N	079 38.54E	67 58N	079 38E	1071790	23723	049 23	23 43						
68	03	07	02.671	4055	68 36.64E	080 11.36E	68 09N	080 11E	1069710	23727	049 56	23 48						
69	03	07	06.727	4055	68 46.74N	080 44.69E	68 19N	080 44E	1067624	23732	050 29	23 53						
70	03	07	10.761	4035	68 56.67N	081 18.39E	68 29N	081 18E	1065567	23737	051 02	23 59						
71	03	07	14.795	4035	69 06.49N	081 52.61E	68 40N	081 52E	1063500	23741	051 36	24 04						
72	03	07	19.872	4276	69 16.75N	082 26.43E	68 50N	082 26E	1061310	23746	052 12	24 09						

TOP SECRET
SPECIAL HANDLING REQUIRED

PASS	DAY	MO	YR
330	28	04	62

FRAME	Z TIME			TIME Diff mil sec	CAMERA NADIR		FORMAT CENTER		ALTITUDE (ft)	VELOCITY (ft per sec)	AZIMUTH		SUN ANGLE		PITCH		ROLL	
	hr	min	sec		Latitude deg min	Longitude deg min	Latitude deg min	Longitude deg min			deg	min	deg	min	deg	min	deg	min
1	03	15	00.621		65 27.68N	169 12.80E	65 28N	169 12E	836725	24243	138	12	30	11				
2	03	15	10.417	4395	65 14.90N	169 40.44E	65 29N	169 40E	837928	24267	138	29	30	12				
3	03	15	16.331	3865	65 53.33N	173 04.40E	65 28N	173 04E	836372	24251	139	02	30	12				
4	03	15	20.586	3785	64 52.16N	170 27.19E	65 10N	170 27E	834877	24254	139	25	30	13				
5	03	15	24.236	3650	64 41.16N	170 49.20E	65 20N	170 49E	833809	24257	139	46	30	13				
6	03	15	27.836	3600	64 30.14N	171 13.71E	64 29N	171 10E	831906	24261	140	07	30	14				
7	03	15	31.421	3535	64 19.16N	171 31.73E	64 44N	171 31E	830530	24264	140	28	30	14				
8	03	15	34.977	3555	64 08.22N	171 52.52E	64 38N	171 52E	829126	24267	140	48	30	15				
9	03	15	38.521	3545	63 57.25N	172 12.57E	64 22N	172 12E	827711	24270	141	30	30	15				
10	03	15	42.046	3525	63 46.33N	172 32.56E	64 11N	172 32E	826323	24275	141	27	30	16				
11	03	15	45.562	3515	63 35.32N	172 52.14E	64 00N	172 52E	824945	24277	141	47	30	16				
12	03	15	49.062	3503	63 24.35N	173 11.87E	63 49N	173 11E	823567	24280	142	05	30	16				
13	03	15	52.551	3498	63 13.36N	173 30.30E	63 30N	173 30E	822204	24285	142	24	30	17				
14	03	15	56.021	3478	63 02.36N	173 48.67E	63 27N	173 40E	820855	24286	142	42	30	17				
15	03	15	59.491	3470	62 51.36N	174 07.20E	63 17N	174 07E	819508	24289	143	03	30	17				
16	03	16	02.941	3453	62 40.35N	174 25.50E	63 06N	174 25E	818176	24292	143	17	30	17				
17	03	16	06.361	3440	62 29.34N	174 43.91E	62 55N	174 43E	816852	24295	143	34	30	17				
18	03	16	09.801	3428	62 18.33N	175 03.50E	62 44N	175 03E	815541	24298	143	51	30	17				
19	03	16	13.216	3415	62 07.33N	175 17.44E	62 33N	175 17E	814237	24301	144	08	30	18				
20	03	16	16.616	3400	61 56.32N	175 34.25E	62 22N	175 34E	812944	24304	144	24	30	18				
21	03	16	20.011	3395	61 45.29N	175 50.91E	62 11N	175 50E	811657	24307	144	41	30	18				
22	03	16	23.396	3385	61 34.26N	176 07.20E	62 00N	176 07E	810385	24310	144	56	30	18				
23	03	16	26.771	3375	61 23.22N	176 23.39E	61 49N	176 25E	809111	24313	145	12	30	17				
24	03	16	30.136	3365	61 12.17N	176 39.27E	61 38N	176 39E	807851	24316	145	28	30	17				
25	03	16	33.521	3365	61 01.09N	176 54.90E	61 27N	176 54E	806596	24319	145	43	30	17				